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ABSTRACT

This curriculum supplement was designed to correlate directly with "A Guide to Curriculum Planning in Technology Education," published by the Wisconsin Department of Public Instruction. It is also a companion book to three other classroom activity compilations, one in each of the other three major systems of technology--construction, manufacturing, and transportation. The entire set--the curriculum guide and the four activity books--follows the content organization given in the "Technology Education Content" fold-out chart in this guide. The activities are organized on the basis of how each supports one of the communications concepts identified on the chart. Materials for this supplement were gathered from throughout Wisconsin and several other states, and most of them were developed by teachers. The eight sections of the guide include 24 activities grouped under the following topics: printing systems and processes, photographic systems and processes, graphic industry products, telecommunications systems and processes, computer systems and processes, electronic communications industry products, interactive light systems and processes, and acoustic storage and retrieval systems and processes. Each activity consists of a description, resources needed, objectives, evaluation focus, procedures, information sheets illustrated with line drawings, and (sometimes) tests and answer sheets. (KC)

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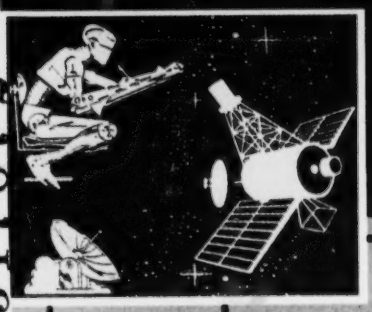

Technology Education

CLASSROOM ACTIVITIES IN COMMUNICATIONS

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Foreword

Technology education is particularly well-suited to respond to our "Education for Employment" initiative and to facilitate career exploration for our students. The classroom activities in this resource relate directly to the technology of communications, one of the four major systems identified in *A Guide to Curriculum Planning in Technology Education* as vital for helping students to understand the technological concepts and processes of the world around them. The other three systems are construction, manufacturing, and transportation, and the Department of Public Instruction has prepared a compilation of relevant activities in each of those systems as well.

As teachers use the concepts contained in the guide and in these companion activity books, we hope they will develop new teaching directions that will enhance students' understanding of technology education and its impact on their present and future lives and careers. We must ensure the timeliness of this particular curriculum because we live in a world affected in every aspect by a variety of sophisticated, often baffling, technologies. In communications, for example, we now use television, fiber-optics, satellites, computers, lasers, and cathode-ray terminals. More information is available to more people in a shorter time, which has the potential for immense social change.

Technology education must take responsibility for imparting a basic understanding of the technological foundations of the many aspects of communications. Materials, products, processes, problems, uses, and developments in the field of communications must be an on-going study, and timely occupational skills must be developed in our students.

These activities have been gathered to facilitate those ends. We encourage teachers, as they use these activities, to modify, expand, and reorganize them to fit individual classroom needs. These activities are intended to be subject to change and continuous improvement, so the Department of Public Instruction welcomes suggestions from users.

Herbert J. Grover
State Superintendent

Acknowledgments

It is not possible to list each teacher or agency that contributed to this collection of activities. Yet without the efforts of many in the field, this publication would not have been possible. We thank everyone that helped assemble this collection for graciously responding to our requests and for freely sharing their knowledge.

Special thanks are due to John Vanderhoof, former Department of Public Instruction (DPI) technology education consultant, for his part in gathering and clarifying the activities; to Dr. Leonard F. Sterry, program director for technology education majors, at the University of Wisconsin-Stout, who provided the original format and organized data collection from the field; and to Dr. Eunice Bethke, Chief, Consultation Section, DPI, for her facilitation and support.

Other DPI staff should also be acknowledged, especially Kathleen D. McCleave, editor of this supplement, for her efforts to find a consistent format and language for the activities and for her insistence on clarity and accuracy in the instructions. She was assisted with book design and graphics by Lisa Buckley. Additional thanks go to Barbara Sumwalt, technology education program assistant; Danni Jorenby, word processor/typesetter; and Kris Whitman, proofreader.

Introduction

This curriculum supplement, *Technology Education: Classroom Activities in Communications*, was designed to correlate directly with *A Guide to Curriculum Planning in Technology Education* published by the Wisconsin Department of Public Instruction (DPI). It is also a companion book to three other classroom activity compilations, one in each of the other three major systems of technology—construction, manufacturing, and transportation.

The entire set—the curriculum guide and the four activity books—follows the content organization given in the "Technology Education Content" fold-out chart. Thus, the activities in this particular book are organized on the basis of how each one supports one of the communications concepts identified on the chart. An activity listed as "2C," for example, would have to do with "Computer Systems and Processes," within the "Electronic" communications system; an activity listed as "4B" would relate to "Phonographs, Tapes, or Disks" within the "Storage and Retrieval Systems and Processes" area of "Acoustic" communications.

Materials for this supplement and the companion documents were gathered from throughout Wisconsin and several other states. Most of the activities were originally developed by individual instructors who are actively teaching portions of the technology education curriculum. Some were developed by state departments of education and by projects supported by those agencies. Still other materials were developed at universities. Since this was a process of *collection*, not *creation*, of materials, some content concepts are not covered at all, and others are represented by several activities. Also, as a collection of activities, this supplement does not contain a master plan for utilization and does not represent full courses. Instructors must identify major themes to be taught in support of these activities, such as the research and development process, system components, safety and tool/machine use, input-process-output model, and so on. In this regard, the content chart can be a useful tool for the development of courses consistent with the philosophy of technology education.

Due to the process used to solicit and assemble these activities, there are additional points that should be kept in mind while using this material.

- The three-hole punched format was selected to permit the publication of the best activities available now, while making it easy to revise and update the activities later. Teachers are encouraged to share new activities as they are developed, or to suggest refinements of the present ones.
- Some activities could be used to support more than one content concept. While an attempt was made to make the best match possible, in some cases an arbitrary decision was made as to placement. Teachers are encouraged to modify placement if it seems more appropriate for a local curriculum.
- Activities were developed in the field, not the office. As a result of individual teacher input,
  — there is not necessarily an activity supporting each concept in the content chart; but there may be more than one activity for some concepts; and
  — the level, language, and length of the activities varies widely.
- An "evaluation focus" has been suggested but individual teachers may wish to change, or add to, the evaluation process.
- Answer sheets are provided where they were provided to DPI or where they seemed necessary, but not all activities have them.
- Activities are usually addressed to one student, but group work is an appropriate modification, depending on an individual teacher's intent for the activity.
- In activities where safety hazards may exist, teachers should note "Cautions" throughout the activity and call them to the attention of students.

- Any of these materials may be copied for student use without restriction. The format was designed to facilitate reproduction in the field.
- The use of brand names (*Apple* computer, specified software) is not meant as a commercial endorsement.
- Some activities are self-contained, but most of them require lecture and/or demonstrations by the instructor.

Technology Education Content

This chart graphically depicts a content organization for the four major systems of technology—communications, construction, manufacturing, and transportation. Within each system, major instructional concepts are identified by number and letter and their specific subject matter is detailed.

The chart is the basis of the technology education program and content models presented in *A Guide to Curriculum Planning in Technology Education* (Madison, WI: Department of Public Instruction, 1988). Awareness and introductory level courses in technology education are drawn from the broad overview of the discipline presented in the first two vertical divisions of the chart. The detailed content necessary for exploratory and elective courses in each technological system comes from horizontal views across the last three divisions of the chart.

The chart is also the organizational basis for this supplemental classroom activity manual in communications. Each activity is keyed to one of the instructional concepts identified on the chart by number and letter. The curriculum planning guide and activity manuals in the other three technology systems—construction, manufacturing, and transportation—are available from the Department of Public Instruction.

TECHNOLOGY EDUCATION CONTENT*

Technology	**Communications**	1. Graphic	**A. Printing Systems and Processes**	**Relief • Screen • Lithography • Gravure • Electrostatic • Ink Jet**
			B. Photographic Systems and Processes	Film Imaging • Electronic Imaging
			C. Industry Products	**Paper/NonPaper Materials • Consumable/Permanent Uses • Film • Print • Video**
			D. Industry Impacts	Economic • Political • Values/Attitudes • Environment • Aesthetic
		2. Electronic	**A. Telecommunications Systems and Processes**	**Radio • Radar • Television**
			B. Hard-Wired Systems and Processes	Telephone • Telegraph • Public-Address Systems
			C. Computer Systems and Processes	**Analog • Digital**
			D. Industry Products	Entertainment • Information/Data • Detection/Control • Computations • Data Exchange
			E. Industry Impacts	**Economics • Political • Values/Attitudes • Environment**
		3. Light	A. Interactive Systems and Processes	Laser • Fiber Optics
			B. Passive Systems and Processes	**Signs • Flashing Signals**
			C. Industry Products	Entertainment • Information/Data • Detection
			D. Industry Impacts	**Economic • Political • Values/Attitudes • Environment**
		4. Acoustic	A. Sonic Detection Media and Processes	Gas • Liquid • Solid
			B. Storage and Retrieval Systems and Processes	**Phonographic • Tape • Disks**
			C. Industry Products	Information/Data • Detection/Control • Entertainment
			D. Industry Impacts	**Economic • Political • Values/Attitudes • Environment**
	Construction	1. Planning Processes	**A. Research and Development**	**Initiating the Project • Developing the Project • Implementing**
			B. Marketing	Analyzing the Market • Establishing Strategy • Promoting • Closing the Sale
			C. Industrial Relations	**Hiring • Training • Providing Benefits • Providing Career Options**
			D. Financing	Appraising Property • Estimating Costs • Funding • Documenting • Budgeting
		2. Production Processes	**A. Preparing the Site**	**Clearing • Setting up Temporary Facilities • Surveying • Earthworking**
			B. Building the Structure	Setting Foundations • Building the Major Structural Elements
			C. Installing Utility Systems	**Installing Permanent Utilities and Mechanical Plant • Providing Temporary Equipment**
			D. Enclosing the Structure (Rough Finishing)	Preparing Materials • Handling Materials and Components • Assembling in Place
			E. Finishing the Structure (Fine Finishing)	**Prep. Subsurfaces • Prep. Materials • Handling Materials • Trimming • Removing Equip. & Debris**
			F. Completing the Site	Removing Temporary Plant and Facilities • Landscaping • Building Features • Shaping the Finishing Earth • Removing Landscaping Equipment and Debris
			G. Servicing the Project	**Diagnosing/Troubleshooting • Repairing • Altering • Installing • Maintaining**
		3. Managerial Processes	A. Planning	Formulating • Researching • Designing • Engineering
			B. Organizing	**Structuring • Supplying • Scheduling • Routing • Storing**
			C. Directing	Coordinating • Assigning • Supervising • Inspecting • Authorizing
			D. Controlling	**Monitoring • Reporting • Correcting**
	Manufacturing	1. Input (Planning Factors)	**A. Material**	**Direct • Indirect**
			B. Human Resources	Managerial • Scientific/Technical • Office/Clerical • Worker/Operator
			C. Capital	**Plant • Equipment**
			D. Finance	Debt • Equity
			E. Knowledge	**Technological • Scientific • Humanities • Formal**
			F. Energy	
		2. Production Processes	**A. Extracting**	**Drilling • Harvesting • Mining • Other**
			B. Primary Processes	Thermal • Chemical • Mechanical • Electrical
			C. Secondary Processes	**Casting and Molding • Forming • Separating • Conditioning • Assembling • Finishing**
		3. Managerial Processes	A. Management Functions	Planning • Organizing • Actuating • Controlling
			B. Types of Managed Production	**Custom • Intermittent • Continuous**
			C. Managed Activities	Establishing the Organization • Designing the Product • Preparing to Produce • Producing • Delivering • Serving • Controlling the System
		4. Outputs	**A. Primary Outputs**	**Raw Materials • Industrial Goods • Finished Goods**
			B. Other Outputs	Scrap • Pollution
	Transportation	1. Planning Base	**A. Elements of Transportation**	**Human Mobility • Movement of Goods and People • Physical—(Natural and Human Produced)**
			B. Conquest of Time and Space	
			C. Foundation	**Inventions • Innovations**
			D. People Systems	Personalized • Mass Transit
			E. Material and Goods Systems	**Natural Forms of Movement • Technologies of Transport**
			F. Mediums	Land • Water • Air • Interrelated
		2. Transporting Processes	**A. Receiving**	**People (Personalized and Mass Transit) • Materials/Goods (Bulk, Gross, Packaged)**
			B. Holding/Storing	People (Personalized and Mass Transit) • Materials/Goods (Bulk, Gross, Packaged)
			C. Loading	**Manual • Manually-Operated Mechanical • Mechanized • Hybrid**
			D. Moving	Terrestrial (Personalized and Mass Transit, Cargo-Bulk/Unit) • Marine • Atmospheric • Space
			E. Unloading	**Automated/Mechanized • Manual/Mechanized • Manual • Hybrid**
			F. Delivering	Means of Delivering to Final Destination
		3. Technical Systems	**A. Energy Sources**	**Electrical • Chemical • Kinetic • Gravity • Mechanical • Magnetic • Solar • Nuclear**
			B. Energy Conversion	Internal Combustion • External Combustion • Hybrid Systems
			C. Propulsion	**Mech. Drive • Hydraulic Drive • Electric Drive • Vacuum • Gravity • Reaction • Storage Devices**
			D. Suspension	Mechanical • Fluid • Magnetic
			E. Control	**Velocity • Directional • Attitude • Altitude • Vehicular and System Control**
			F. Guidance	Guideways • On-Board and External Devices • Interrelationship of Guidance and Control
			G. Structural	**Vehicular Design Considerations • Guideway Design Considerations • Support System Structures**
			H. Support	Physical Facilities • Personnel • Regulatory Factors • Operational Systems
		4. Environmental Factors	**A. Human/Social**	**Safety • Human Values & Desires • Enhancement of Social, Recreational, Cultural Prog. & Facilities • Comfort/Convenience • Demand Responsiveness • Service for Handicapped & Disabled • Privacy**
			B. Economic/Service	Transportation Costs • Access to Employment Opportunities • Efficiency
			C. Physical/Functional	**Effects on Land Use • Adaptable to Future Needs • Flexibility • Adaptable to Intermode Operation**
			D. Aesthetics	General Appearance • Conservation of Natural Resources
			E. Interrelated	**Noise Level • Pollution Characteristics • Neighborhood Growth and Development • Accessibility**

*Based on taxonomies appearing in Thomas Wright and Leonard Sterry (co-directors). *Industry and Technology Education: A Guide for Curriculum Designers, Implementors, and Teachers.* Lansing, IL.: The Technical Foundation of America.

(1A) Printing Systems and Processes

Communications

Gold Stamping, an activity supporting the Graphic Communications concept, is designed for approximately 2 class periods.

Resources Needed

Equipment
Stamping machine

Material
Gold stamping material

Suggested Reference
Broekhuizen, Richard J. *Graphic Communications*. Bloomington, IL: McKnight Publishing Co., 1979.

Objectives

The student will
compose a type layout;
set the type;
use special composing stick and pencil holder for stamping machine; and
correctly operate stamping machine to transfer gold stamping material to a pencil.

Evaluation Focus

☐ Knowledge	☒ Problem Solving	☐ Attitude
☒ Awareness	☐ Machine/Tool Usage	

Gold Stamping

Procedure

Gold stamping is a process by which foils (gold, silver, metallic, others) may be impressed on pencils, pens, paper, playing cards, and a multitude of other materials. This is accomplished through heat and pressure. Even leather goods and books may be printed by this method.

If an impression results in thick letters, it usually means too much time and too high a machine temperature were used. Faint impressions mean too little time or too low a temperature were used. If the impression is faint, the procedure should be repeated using a new piece of foil. It is always better to inspect the job *before* moving it in the type holder or moving the object being imprinted. Be sure to check carefully.

1. Make a layout for the type to be used in this operation. Have the layout checked by the instructor *before* setting the type. Proof type form as usual, and make corrections.

2. Place type in special composing stick (type holder).

▶ Caution

The stamp press should be used only with your instructor's permission and/or presence.

3. The stamping machine should be turned to high heat. The usual heat will be 200 degrees for pencils, paper, etc. It should be about 300 degrees for pens.

4. If an imprint is to be placed on pencils, a special holder for the pencils is used. (This is used for pens also.)

5. Position the type holder in the machine and fasten it securely. Place pencil holder in place, and bring handle of machine down until the type almost touches the pencil. Make any slight adjustment necessary to get the type centered and positioned properly. The handle is raised to normal position, and foil is placed on the pencil directly under the type. Lower handle and press *slightly* on the pencil, holding it in this position for about five seconds. Raise handle to normal position.

6. When finished, turn machine off, remove plug from wall, remove type holder, and distribute type.

7. Answer the questions on the Student Response Sheet.

Gold Stamping

Name _____

Class/Period _____

1. Explain hot stamping.

2. How is this method different from other types of printing?

3. What kind of type is used for this method?

4. This method makes use of two conditions in the stamping press. Name them.

(1A) Printing Systems and Processes

Communications

Newsroom, an activity supporting the Graphic Communications concept, is designed for approximately 5 class periods.

Resources Needed

Equipment

Apple computer system (preferably with two disk drives and a mouse, although only one disk drive and a keyboard are required)

Material

The Newsroom software, available from Apple computer dealers

Objectives

The student will

understand and use *The Newsroom* software;
develop an understanding of the processes involved in electronically creating a newspaper or other similar publication;
become familiar with the terminology utilized in the journalism and newspaper industry; and
write, design, and produce a newspaper issue.

Evaluation Focus

☒ Knowledge	☒ Problem Solving	☐ Attitude
☒ Awareness	☐ Machine/Tool Usage	

Newsroom

Procedure

The Newsroom is an educational software program created for journalists of all ages. It provides a fascinating introduction to the world of journalism and newspapers. With *The Newsroom*, you can develop newspapers, newsletters, brochures, flyers, and informational packets for your business, school, class, club, team, family, and neighborhood. You can write, edit, and illustrate, while adding your own personal touch to each publication.

When you are working in *The Newsroom*, you are busy organizing thoughts, translating them into prose, creating photos out of clip art, laying out pages, and rolling the presses. You'll find it fun to write your own newspaper, and doing so challenges your organizational skills, writing abilities, and creative thinking processes. Use of *The Newsroom* is limited only by your imagination. Use it to create a newspaper of at least five pages.

Data Storage

As you create the different parts of your newspaper, you will need to save each of them to a data disk. Obtain a blank disk and initialize it in Apple DOS 3.3 format using *DOS System Master* or other 3.3 initialization program. (*The Newsroom* does not possess an initialize routine.) Label it clearly as a "Newsroom Data Disk." To save your work, select the disk icon from any work area. Enter a file name (eight-character maximum), and press the return key. Try to use a name that will help you remember what it is.

Cursor Movement

The Newsroom's cursor must be moved around the screen to select things. Depending on its function at the moment, it may appear as a small arrow, a text cursor, a hand for picking something up, a blinking box outline, or a drawing shape. Cursor movement varies depending on the hardware being used.

Joystick

If you are using a joystick, orient it so that the cursor moves up when you push the stick forward, left when you push left, etc. Press a joystick button to make a desired selection, pick something up, or drop something. When using any of the drawing tools, hold a button down to draw.

Mouse

If you are using a mouse, simply move the mouse on its table to control the cursor. Press the mouse button to make a selection, pick something up, or drop something. When using any of the drawing tools, hold the mouse button down to draw.

Keyboard (IIe and IIc only)

If you are using only the computer keyboard, use the arrow keys to move the cursor. Press the open/closed Apple keys to make a selection, pick something up, or drop something. When using any of the drawing tools, hold the open/closed Apple keys down with the arrow keys to draw.

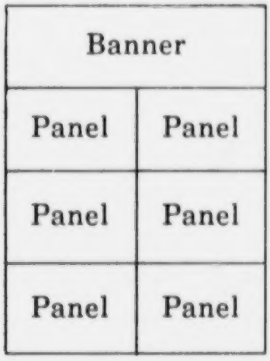
Now, you are ready to begin developing a newspaper page, using the various features of *The Newsroom*.

The Banner

The banner is the place where a newspaper identifies itself by printing the paper's name. It is most commonly done in large letters above or just below the headlines on page one. Sometimes it is referred to as the "logo" or "flag." The banner should not be confused with the masthead, which is a small box often found on the editorial page containing the publisher's name, address, and subscription information.

The Copy Desk

In the Copy Desk work area, you write the "copy" (words in a news story) for your newspaper. When you enter the Copy Desk work area, you will find a number of icons displayed at the left of the inverse video work area. This work area represents one newspaper panel. When printing on 8-1/2" x 11" paper, your newspaper will consist of six panel areas and one banner area as shown.



You will work on one panel at a time by combining text with photos developed in the Photo Lab work area. *The Newsroom* enlarges the panel area in this work area in order to maximize printer resolution, creating unusually sharp printouts. It also makes it much easier for you to position your photos and edit your text. When it prints out, it will be reduced to its proper portion of the newspaper page.

Don't let the panels restrict you to writing stories that fit inside only one panel. Remember to think of these panel outlines as imaginary frames. Your story can fill two panels or three or the whole page. If you fill one panel with photos or text but have not yet completed your story, select the disk icon and save this panel to your data disk. Then select the garbage can icon and clear the work area so you can continue your story on a second panel.

The Photo Lab

The Photo Lab allows you to create your own photos for inclusion in your newspaper. It is similar to the Banner work area in that it provides you with the library of clip art and the different graphic tools. Once the artwork for the photo is complete, you can "crop" it so that the photo contains exactly the artwork you desire and has the proper dimensions.

A photo is added to the newspaper in the Copy Desk. There it can be combined with text and/or additional photos and be positioned in one of the panels. A photo can be as small as you like or as large as the Photo Lab work area.

Layout

When your banner and all your panels have been made, they can be arranged onto a page in the Layout area of *The Newsroom*.

The Printing Press

Once a page has been defined in the Layout area, you can begin to run the printing presses and actually produce your newspaper. Or, if you want to see how a photo, banner, or panel looks on paper, you can print out a copy for inspection.

The Wire Service

The Wire Service allows you to use a modem, if you have one, to send or receive pages, panels, banners, or photos that have been created in *The Newsroom*. This is an optional feature and is not required for you to create your newspaper.

(1A) Printing Systems and Processes

Communications

Offset Layout Package, an activity supporting the Graphic Communications concept, is designed for approximately 5 class periods.

Resources Needed

Equipment

Typewriter or Varitype machine

Supplies

Standard paste-up tools and supplies
Newspapers
Line gauge or pica ruler
Large display letters
Poster board
Speedball pens/india ink

Suggested Reference

Broekhuizen, Richard, J. *Graphic Communications*. Bloomington, IL: McKnight Publishing Co., 1979.

Objectives

The student will

practice paste-up and layout techniques;
understand the point system of measuring;
recognize typical type sizes and styles; and
become aware of how layout enhances written communication.

Evaluation Focus

☒ Knowledge
☒ Awareness
☒ Problem Solving
☐ Machine/Tool Usage
☐ Attitude

Offset Layout Package

Procedure

As the graphic arts industry continues to grow—gross receipts in the industry climb at the rate of more than $350 million a year—the need for persons skilled in graphic arts techniques grows also. Job opportunities in the preparation of material for the graphic arts camera increase daily. Not only are more and more daily and weekly newspapers "going offset," but many letterpress publications find it economical to paste-up display and advertising pages using cold type methods. Design flexibility is a key feature of paste-up. This flexibility is particularly suitable to supermarket and drugstore advertisements. Business publications, technical reports, magazines, and many others use camera copy preparation techniques.

These activities are intended to explore paste-up and layout techniques. Exciting and well-paid job opportunities exist for individuals who develop skills in graphics layout work.

Classification of Typefaces

Most type styles in use today fall into six major classes—text, script, roman, sans serif, square serif, and italic. An awareness of these classes will be of help to anyone designing, specifying, or planning printing jobs. Important considerations include proper combinations of type styles, correct spacing of elements, relation of type style to printed material, and readability and legibility.

Words to know: text, script, roman, sans serif, italic, square serif, reproduction proofs, ascender, descender.

1. Create your own paste-up area by outlining a paper area of 8-1/2" x 11" and an image area of 7-1/2" x 10", as on the Paste-Up Model.

2. Rule a 4-point border around the paste-up as shown.

3. Samples of six different typefaces are given. Paste them in the positions indicated.

4. Paragraphs of appropriate copy, labeled "A-G," are also given. Paste them on the reproduction proofs where indicated.

5. Cover the finished paste-up with a protective cover.

Classification of Typefaces
Paste-Up Model

Classification of Typefaces

Text

Script

Roman

Square Serif

Sans Serif

Italic

Classification of Typefaces
Copy

Copy A All of the type styles in use today fall into one of the broad, general classifications listed on this page. It is convenient to be able to identify types in these classes so that they may be used and mixed harmoniously.

Copy B Text Letters

Text letter is an angular letter form suggestive of the medieval scribes. It is used largely in social printing.

Copy C Roman Type

This is an easily read typeface that is traditional in character. The letters are formed with heavy strokes and contrasting light elements. They are easily read when set in large masses.

Copy D Sans Serif Letters

This is an example of a popular contemporary type style. The letters have no serifs and reflect simplicity and strength. They are stripped of all unnecessary adornment.

Copy E Script Letters

The sample illustrates a type group that denotes a hand-lettered or written effect. This lettering style adds contrast and color to a printed piece.

Copy F Square Serif Letters

Types with serifs were patterned after early stonecutter letters. The strokes are approximately uniform in weight and have straight, unbracketed serifs.

Copy G Italic Letters

Designed by Aldius Manutius in 1501, these letters are close fitting and slanting. They may be used to contrast with Roman type forms, though large masses set in italic are hard to read.

Classification of Typefaces
Type Samples

Text	*Script*
Roman	**Square Serif**
Sans Serif	***Italic***

Point System

Knowledge of the printer's point system is important in understanding and handling paste-ups. This system is the accepted standard of communicating dimensions in the printing industry. It should be learned as one of the preliminary steps to any work in the graphic arts.

The printer's point system consists of the following measurements:

1 point	=	1/72 inch
1 nonpareil	=	1/12 inch or 6 points
1 pica	=	1/6 inch or 12 points
6 picas	=	1 inch or 72 points

Further, newspaper advertisements are measured in agate lines, which are 5-1/2 points high.

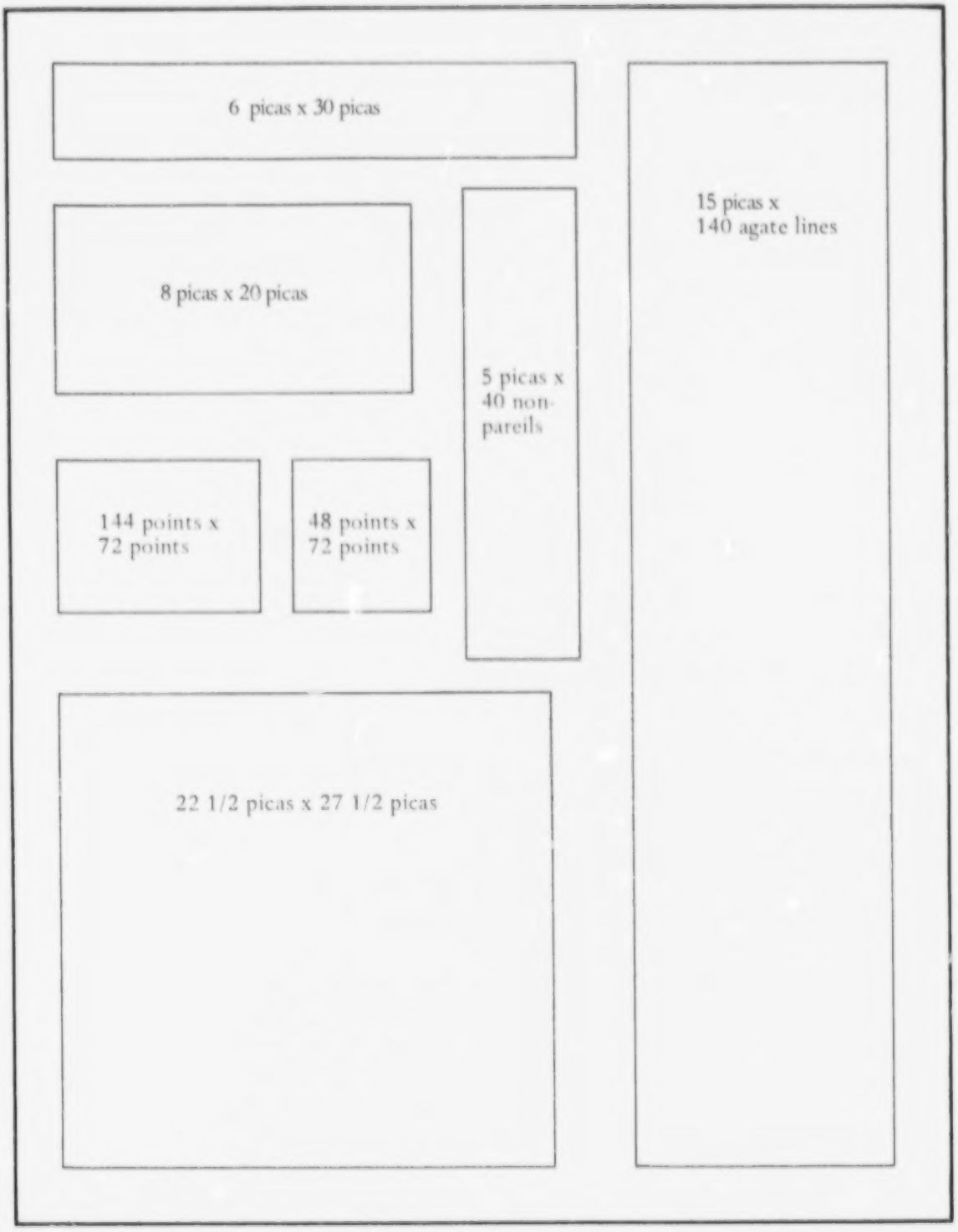
Words to know: point, nonpareil, pica, agate line, line gauge, print trimmer, lead, slug.

1. Outline a paper area of 9" x 12" and an image area of 8-1/2" x 11" on a piece of illustration board, as on the Paste-Up Model.

2. Using a line gauge, trim seven squares of paper to the exact dimensions specified on the Paste-Up Model.

3. Paste these down in the positions shown, and cover the completed paste-up with a protective cover.

The Point System
Paste-Up Model



Common Type Sizes

It is particularly helpful for the offset or letterpress operator to be able to identify and visualize common type sizes. The paste-up person should also become familiar with sizes in wide use today.

Words to know: nonpareil, pica type, agate line, brevier, long primer, line gauge.

1. Outline a paper area of 8-1/2" x 11" and an image area of 7-1/2" x 10" on a piece of illustration board, as shown on the Paste-Up Model.

2. Hand letter (with Speedball pen) the words "Common Type Sizes" in black india ink, as shown on the model.

3. Draw two 6 point rules, 8" long, as shown (use the ruling pen).

4. Study the point sizes given on the Sample Page. Note that the letters in each point size are smaller than the size given. Point size always designates the body of the type on which the character sits. There is always some shoulder, and therefore the characters measure somewhat smaller than the point size.

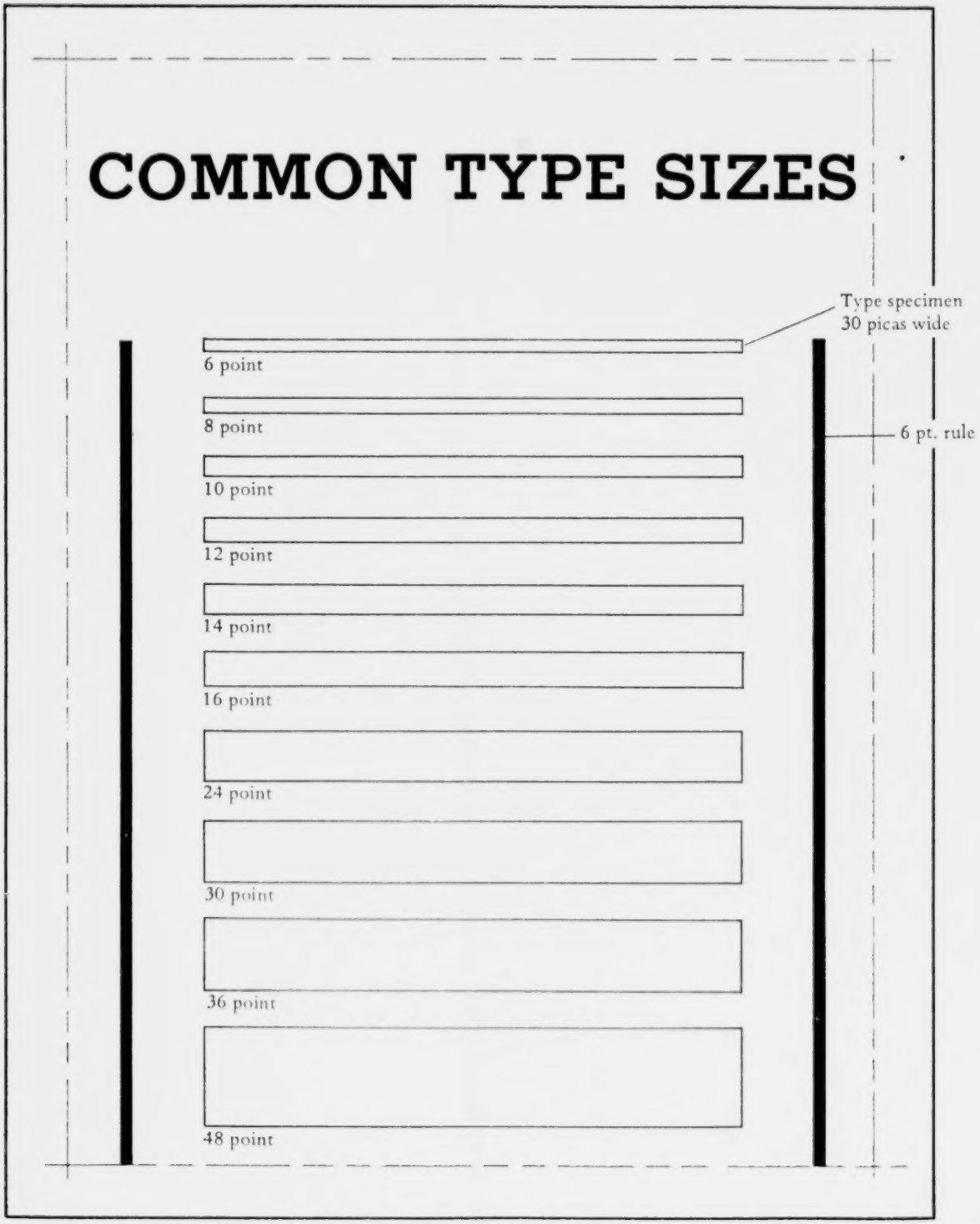
5. Obtain and paste down specimens of 6-, 8-, 10-, 12-, 14-, 18-, 24-, 30-, 36-, and 48-point type as indicated on the rough layout. These may be obtained from magazines, newspapers, brochures, and any other clearly printed source.

6. Label each specimen using a small-tip Speedball pen.

7. Be sure to consider carefully the available margins and white space. Allow ample margins around and space between each specimen.

8. Cover the finished paste-up with a protective cover.

Common Type Sizes
Paste-Up Model



Common Type Sizes
Sample Page

Making a Simple Paste-Up

The purposes of this activity are to learn to use basic paste-up tools and to develop elementary paste-up skills. This lesson also develops an ability to evaluate space.

This activity includes choosing the correct size and style of typeface for a standard business card, letterhead, and envelope combination. Normally, the letterhead, envelope, and business card use progressively smaller type sizes. The letterhead uses the largest type, the matching envelope uses smaller type, and the business card uses an even smaller type size. However, there is a tendency today to use the same size type on both the envelope and the business card.

Words to know: harmony, paste-up, image area, reproduction, proof, rough layout, align.

1. Obtain a piece of illustration board, 8-1/2" x 11".

2. Outline the paper area with blue pencil in the positions shown on the Paste-Up Model. These areas should be in the following sizes:

   business card—2" x 3-1/2"
   letterhead—8-1/2" x 11"
   envelope—3-5/8" x 6-1/2"

3. Within the above areas, outline an image area that will allow for sufficient margin around all copy.

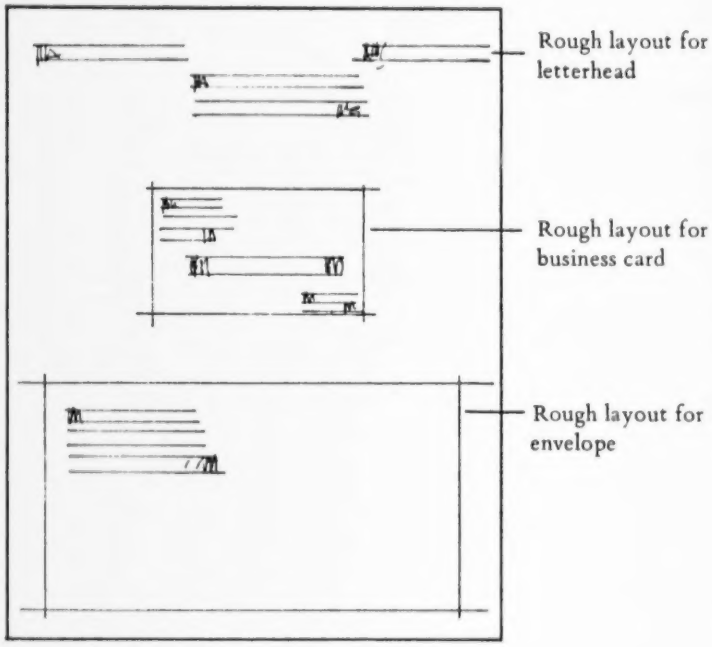
4. Carefully trim the proof to within 1/16" of the image.

5. Select a harmonious grouping of type sizes from among those included on the Sample Page.

6. Paste-up all type as shown on the model. The finished paste-up should be carefully done, with all lines of type pasted down parallel and aligned in a satisfactory manner.

7. Cover the finished paste-up with a protective cover.

Making a Simple Paste-Up
Paste-Up Model



Making a Simple Paste-Up
Type Samples

Esser Printing Co.

Offset
Letterpress
Telephone
255-8559

Esser Printing Co.

Offset
Letterpress
Telephone
255-8559

Esser Printing Co.

305 Oak Road
Billings, Mont. 77424

Offset
Letterpress
Telephone
255-8559

305 Oak Road
Billings, Mont. 77424

ESSER PRINTING CO.

Offset
Letterpress
Telephone
255-8559

305 Oak Road
Billings, Mont. 77424

Esser Printing Co.

305 Oak Road
Billings, Mont. 77424

Offset
Letterpress
Telephone
255-8559

ESSER PRINTING CO.

305 Oak Road
Billings, Mont. 77424

Using White Space

Any printed piece has two complementary design aspects—the printed areas and the nonprinted areas. They are both subject to the designer's manipulation. The nonprinted areas are often referred to as "white space," or negative space. It is necessary for the printing designer to be aware of the importance of white space, because it affects the readability, appearance, and effectiveness of the design. This activity presents a design problem in using white space effectively. When planning the paste-up, an effort should be made to judge spatial relationships and make optimum use of white space.

Words to know: negative space, white space.

1. Outline a 9" x 12" paper area on an illustration board, as shown on the Paste-Up Model.

2. Plan and outline a pleasing image area for the 9" x 12" size paper.

3. Hand letter, in black india ink, the two display words "Layout" and "Design" approximately 60 points high.

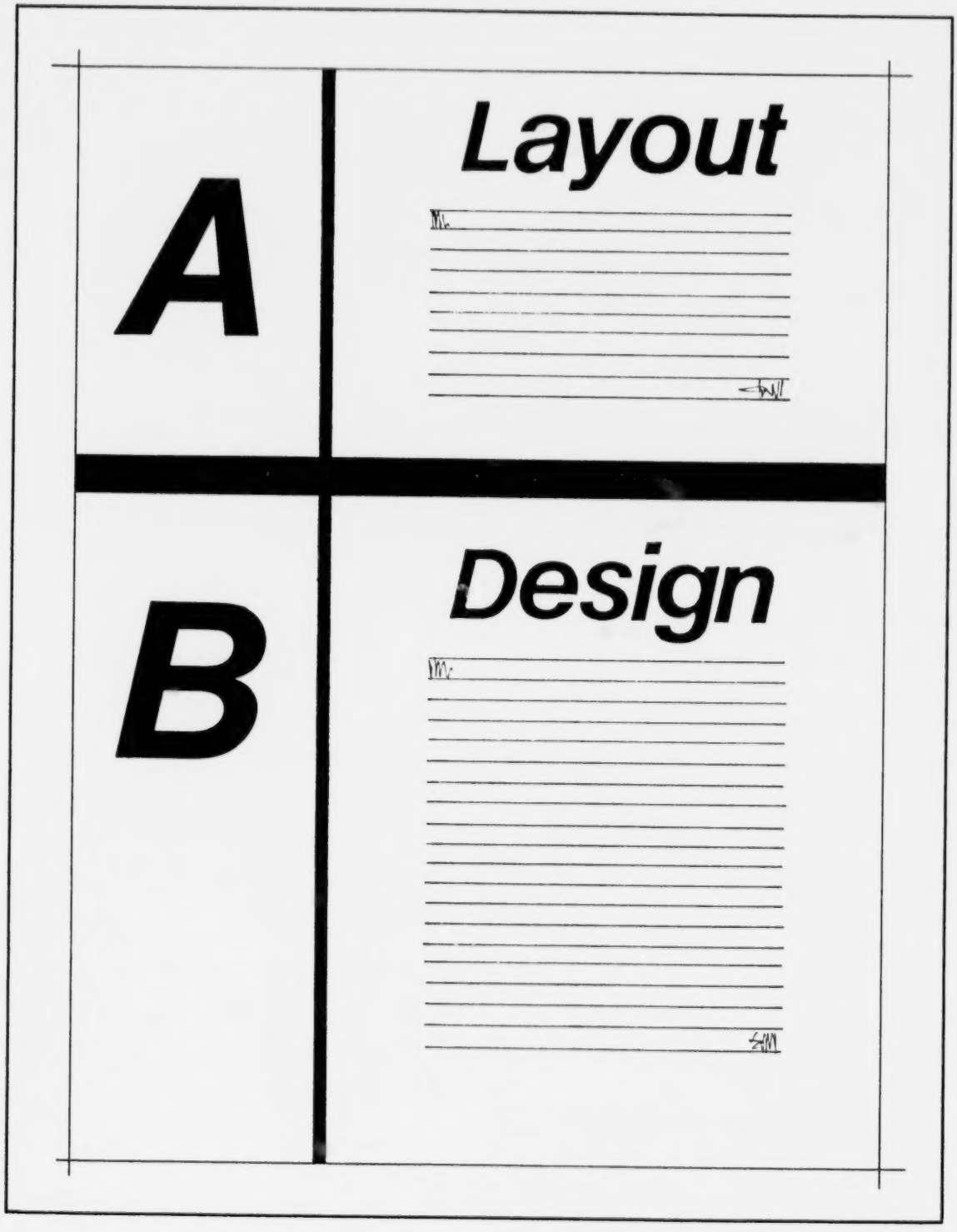
4. Using the ruling pen, rule an 18-point and a 6-point solid rule as shown on the model.

5. Paste down the two paragraphs of sample copy. The widths of these paragraphs bear an important relationship to the negative or white space areas.

6. Position two large display letters. Plan the white space areas around each letter.

7. Cover the finished paste-up with a protective cover.

Using White Space
Paste-Up Model



Using White Space
Copy

Copy A

A good layout is the essential first step in planning and producing a printed piece. It serves as a guide for others working on the job, from the estimating department to the bindery department. The effort invested in the careful planning and laying out of a job will be repaid many times. It provides a place in which to explore designs before work is actually begun on the printed piece. A layout may be changed, redesigned, or improved without incurring any production expenses. Costs rise sharply when type has to be reset or printing plates remade.

Copy B

A design should be based upon some logical principle, plan, or order which lends itself to artistic appreciation. The subtleties which form the basis for much contemporary design are often unobserved by those schooled in the strict confines of traditional design philosophy. Therefore the successful design need not conform to the rigidities of formal balance. It does mean that all parts of the design be integrated or bear a relationship to one another. Therefore, artists and designers rely upon such devices as axis, pivot points, space relationships, and type harmony in order to achieve a unity of elements in the design. Without some cohesive relationship, the design will appear as a disturbing assortment of pictures, type, and illustrations.

Cross Rule Forms

Preparing cross-rule forms by the letterpress method is done by either setting the form in type and cutting the rules, or by the use of a tabular broach machine. These and other methods, including linotype and Ludlow, were satisfactory for letterpress printing. Since offset printing does not require metal type, the ruling pen has been increasingly used in preparing these types of forms.

This requires an ability to rule evenly spaced lines of uniform thickness. This activity emphasizes the need for uniformity of spacing between lines.

Words to know: tabular broach, mortise.

1. Outline a paper area of 5-1/2" x 8-1/2" with an image area of 5" x 8", as shown on the Layout Model.

2. Type Copy A and Copy B (below) using a VariTyper or a standard typewriter. (You may substitute the heading from a readily available business form if you like.)

3. On a separate sheet of paper, rule out the form, as shown in the Layout Model.

4. Cut out a box and mortise in the column heads from behind with transparent tape.

5. Carefully trim the right and left margins of the form to create a perfect alignment of the rules.

6. Paste the rule form down in position as shown in the layout.

7. Paste down the heading as shown.

8. Cover the finished art with a protective cover.

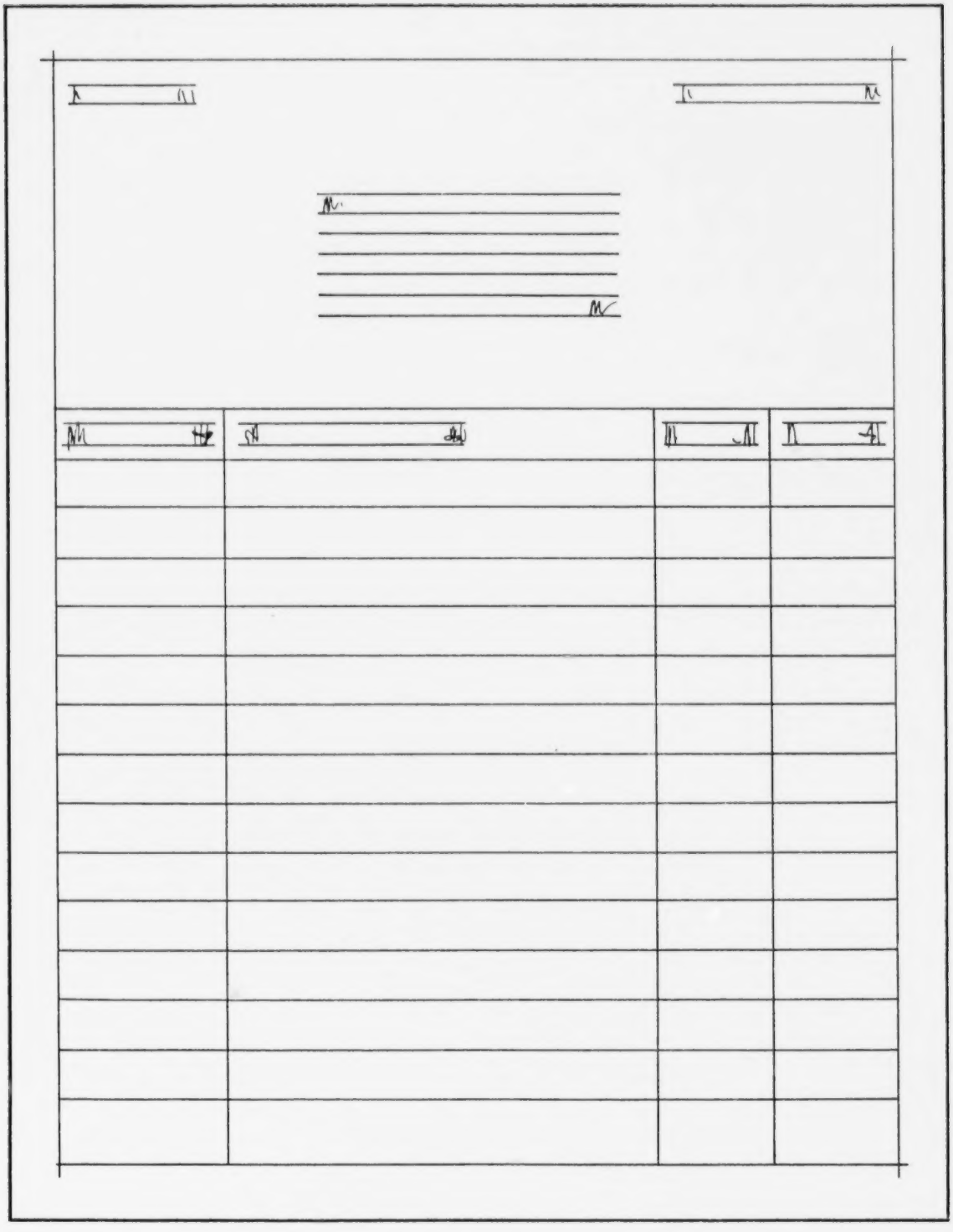
Layout Copy

Copy A Offset Letterpress

YOUR NAME PRINTING CO.
Your Home Address
Your City and State
Your Phone

Copy B Quantity Description Unit Total

Cross-Rule Forms
Layout Model



Store Display Advertisement

Hardware stores and supermarkets often use newspapers, leaflets, and direct mail pieces as promotional advertising. These ads include text in boxes, bordered copy, illustrations, and large display prices. Paste-ups for these jobs require that a large amount of copy and illustrations be placed in a relatively small area. To facilitate pasting up, it is often best to work oversize and then reduce for final printing.

The secret in designing these jobs is careful planning and use of available space. Since copy, illustration boxes, and text must be placed in the ad, it is essential that each element be planned to fit exactly.

Before beginning the paste-up, the artist should execute a carefully done layout, indicating the position of all elements of copy. Then blue pencil guidelines should be drawn on the illustration board to locate each piece of copy, border, box, etc. Finally, the large display letters are pasted down, copy is inserted into the boxes, and text and proofs are pasted down.

Words to know: display advertisement, bordered copy.

1. Outline a 7-1/2" x 10" image area on a piece of illustration board, 8-1/2" x 11".

2. Study the Paste-Up Model of an advertisement for Hanley Hardware as an example.

3. Following a carefully prepared layout, rule in the appropriate guidelines for all boxes, borders, rules, etc., in light blue pencil.

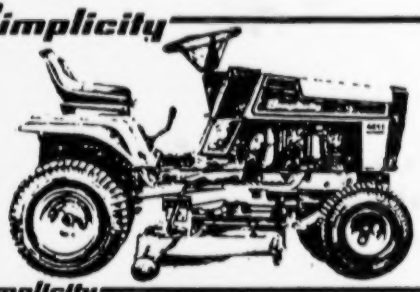
4. Use black india ink to draw rules and boxes. Apply pressure-sensitive tape for bordered boxes.

5. Trim proofs and paste them into the boxes and other areas where text is to be placed. Paste large display lettering in place.

6. Cover the finished paste-up with a protective cover.

Store Display Advertisement
Paste-Up Model

Simplicity



Lawn Tractor

#4211 with 11 hp Briggs Industrial/Commercial engine. 36" cut width, axle mounted mower pivots with ground for smooth cut. Key electric start.

Gear drive transmission
5 speeds fwd., 1 rev.
Reg. $2199.00.
Save $544!
$1,655.00

Hydrostatic drive transmission
Infinitely variable to 5.3 mph.
Reg. $2599.00.
Save $744!
$1,855.00

Simplicity

Riding Mower w/Grass Catcher

#3110, 10 hp, electric start, 36" width cut. Heavy-duty welded and reinforced frame to assure long life. Iso-Body ® Construction isolates operator from engine vibration. Hinged hood. One pedal clutch/brake. Axel-mid mower. Reg. $2094.00
$1,549.00

Leaf Blower

#PB-210E. Hand-held, lightweight yet powerful. 21.2 cc engine. Designed for easy starting.
A bargain at regular price of
$169.95

Thompson's Water Seal

Waterproofs wood, brick and concrete. Prevents cracking and chipping. 375.170 (10101)
$9.99 gal.

Hank's Favorite

Long-Life Exterior
Latex House Paint

Blister resistant, non-yellowing, for wood and hardboard siding. In white and customer colors.
$8.47 gal.

21" Push Mower w/Side Bag

#7073 S.B., 4 hp, recoil start, 14-gauge steel deck. One-year limited warranty

LAWN-BOY

A CUT ABOVE

Reg. $349.95.
Save $50!
$299.95

Haven't you done without a Toro long enough?*

TORO

21" Self-Propelled Mower w/Bagger

#20684 with GTS 2 cycle engine, blade brake clutch and easy Empty® rear bagger. Reg. $599

Save $100!

$499.00

Chore Gloves

Sturdy yellow fleece glove w/knit wristband. 651-315 (429) F-12
3 pair for
$2.99

POLY-TECH

Ruffies

Heavy-duty, leak-proof trash and can liners.

6-Bushel Bags, 12 ct.
30-Gallon Bags, 25 ct.
13-Gallon Bags, 40 ct.

Must buy 2 bags for rebate. Limit 6. 328-724, 524-629, 587 (RL107,104, 102)

2 for $3
Less $1 rebate
2 for $2.00

UNION Manure Fork

With 5 tines, for hay, grass, manure. 12-1/2" head, 48" handle. 322-008 (FK54)
$11.00

Hardware Hank Crabgrass Preventer Plus

Fertilizes as it controls crabgrass. Covers 5,000 sq. ft. 356-113 (CP22311)
20 lb. bag
$8.99

Chain Saw

#011AVEQ
2.5 cu. in., 16" Bar

Compact, lightweight w/heavy-duty, anti-vibration system, auto chain oiling, specially impregnated, long-life cylinder and more. Reg. $239.95.
$219.95

Bamboo Rake

Clears away 24" of dead leaves and grass with every sweep. Coil spring and metal reinforcing assure long, rugged service. Lightweight. Limit 2 per customer. Buy 2!
401-661 (STH24)
$2.49

PRECISION PRODUCTS

Spreaders

Your Choice
$19.99 ea.

Broadcast Spreader adjusts for 4-8 ft. wide coverage. 50-lb. load poly hopper. 244-202 (SB50BMT)
Drop Spreader w/fingertip flow control. 70-lb. load poly hopper, 20" wide. 244-194 (FH22)

Kelley Heavy-duty Wheelbarrow

Rugged, seamless steel tray has 4 cu. ft. capacity. Big, 8" two-ply rated pneumatic tire rolls smoothly under heavy loads. 854-182 (KB4)
$25.88

Mower tune-ups starting at $25. Expert chain and blade sharpening.

All advertised manufacturers' rebate coupons are available in the store. All advertised prices are effective through the last day of the sale or while supply lasts. We reserve the right to limit quantities. We reserve the right to issue rain checks. Part numbers may be limited. Check in store for details.

Hanley

Power Center • Hardware • Farm • Turf

641 W. Main Street

Mon., Thurs. Open 7:30 to 8
Tues., Wed., Fri., Open 7:30 to 5:30
Sat., Open 7:30 to 5

VISA MasterCard

Sale ends Saturday, April 11.

BEST COPY AVAILABLE

(1A) Printing Systems and Processes

Communications

Offset Printing Theory, an activity supporting the Graphic Communications concept, is designed for approximately 5 class periods.

Resources Needed

Equipment

Offset printing press
Plate-making equipment

Materials

Negatives
Plates
Blanket
Brayer

Suggested Reference

Cogoli, John E. *Photo Offset Fundamentals*. Bloomington, IL: McKnight Publishing Co., 1980.

Objectives

The student will

learn the basic theory of offset printing;
design a form to be printed;
prepare the plate needed for the offset process; and
attach the plate to the press and run a required number of copies.

Evaluation Focus

☒ Knowledge
☐ Awareness
☐ Problem Solving
☒ Machine/Tool Usage
☐ Attitude

Offset Printing Theory

Demonstrations

In addition to a study and discussion of written material, students will gain a deeper and fuller understanding of the theory and practice of fundamental offset principles by watching demonstrations of key steps in the printing process.

Platemaking and Presswork

A demonstration of offset principles requires that platemaking equipment and a simple offset press (such as a duplicator) be available.

Expose and develop a presensitized paper or metal plate using an available stripped-up flat. Explain each step and the materials used.

Mount the plate on the press (which has been prepared for the printing operation). Show how the plate is dampened and how the plate image picks up coverage of ink. Stop the press and allow the students to examine the plate.

Transfer the plate image to the blanket, and again stop the press. Point out how the blanket image is a "mirrored image" of the plate image.

Take a few impressions and pass out the printed sheets to the students. Close the demonstration by showing the students how the plate is preserved and stored for future use.

Plate and Proof Press

If it is neither desirable nor convenient to demonstrate with an offset duplicator or offset press, many of the same principles can be demonstrated with an offset plate and letterpress proof press.

For this demonstration, build up the proof press bed with a block of wood and several sheets of thin cardboard so that the press gives a slight squeeze impression. Also ink a hand brayer and an ink slab with offset ink.

Demonstrate the exposure and developing of an offset plate (as above) or take from storage a previously used offset plate.

Place the plate, image side up, on the built-up bed of the proof press. Wash the preservative from the plate surface with a sponge and water and roll the image with the hand brayer. It may require several passes with the brayer to build up the image with sufficient ink. If so, sponge off the plate with water between inkings. If water accumulates on the brayer, remove it by rolling the brayer on clean newsprint.

Place a sheet of printing paper on the inked plate, and pull an impression. Additional impressions may be taken if the plate is moistened and then inked before each additional impression.

This demonstration will show the "grease and water" theory and also the "mirror reversal" of the plate image when it prints on the paper.

Conclude by showing how to prepare the plate for storage. Then hold a discussion on what has been demonstrated.

Plate, Blanket, and Proof Press

A third demonstration involves the same set-up of offset plate and proof press. In addition, an offset-press blanket or a portion of one is needed.

After washing off and rolling the plate with ink, place the blanket over the plate and pull an impression on the proof press.

Remove the blanket and show that the image printed upon it is a "mirror image" of the plate image.

Next, remove the offset plate from the proof press and place the blanket (image side up) on the built-up proof press bed.

Place a sheet of printing paper on the blanket and pull an impression. Show that the impression printed on the paper is a "right-reading" duplicate of the plate image.

In this demonstration, additional sheets may not be printed unless a blanket is washed between impressions. However, the inclusion of the blanket makes this a convincing demonstration.

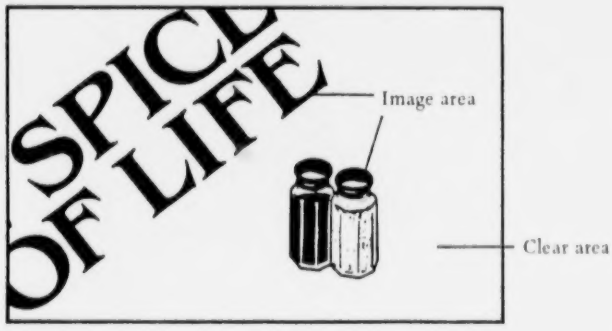
Conclude, as before, with plate preservation and class discussion.

Offset Printing Theory

Procedure

This activity will be confined to the offset process of printing. It should be noted that there are several additional names by which the offset process is known: photo-offset, lithography, photo-lithography, photo-offset lithography, and offset lithography. As generally used, the above names refer to the same process. For convenience the term "offset printing" will be used throughout.

Offset printing is a planographic method of printing; that is, it employs a flat, thin printing plate on which the image (or printing area) is level with the non-printing area. In other words, the part of the plate spice that does the printing is neither raised above nor cut below the surface of the plate.



Offset printing can be done from a flat plate because of a fundamental chemical fact; grease and water do not mix easily.

The Plate

As purchased or pre-prepared, the offset plate is a thin sheet of paper or metal treated chemically and mechanically so that its surface will retain a thin film of applied moisture.

The message to be printed (the image) is placed on this plate by a photographic-chemical process, employing in its final steps the developing of the image by "greasy" or "fatty" ink. The image may also be created directly on the plate by typing, hand lettering, or drawing; in each case using special lithographic typewriter ribbons, pencils, tusche, or ink that will cause a "greasy" image on the plate.

A completely prepared offset plate actually contains two separate and distinct areas on its flat surface: 1) the image (printing area), composed of greasy and fatty ink; and 2) the clear (nonprinting) area.

If a water-saturated cloth pad is passed over the entire surface of a completed offset plate, it will be observed that a thin film of moisture will adhere to the clear areas of the plate. Moisture will not adhere to the inked image area—instead, it actually will be seen to run off and pull away from the greasy-inked image.

If now a brayer charged with greasy lithographic ink is passed over the entire plate, it will be observed that a deposit of ink is added to the greasy-inked image, and that no ink adheres to the dampened, clear areas of the plate. The following conclusions are then evident.

1. The greasy-inked image is receptive to ink, but will repel water.

2. The dampened, clear area of the plate is receptive to water, but will repel ink.

However, if an ink-charged brayer is passed over an offset plate that has not been moistened, the ink will adhere to the entire surface of the plate—image and clear areas alike.

On commercial offset presses, the water and ink are fed automatically to the offset plate. The press operator maintains and controls a judicial balance between the amounts of ink and water that are allowed to reach the plate. This balance insures that only the image portions of the plate will print.

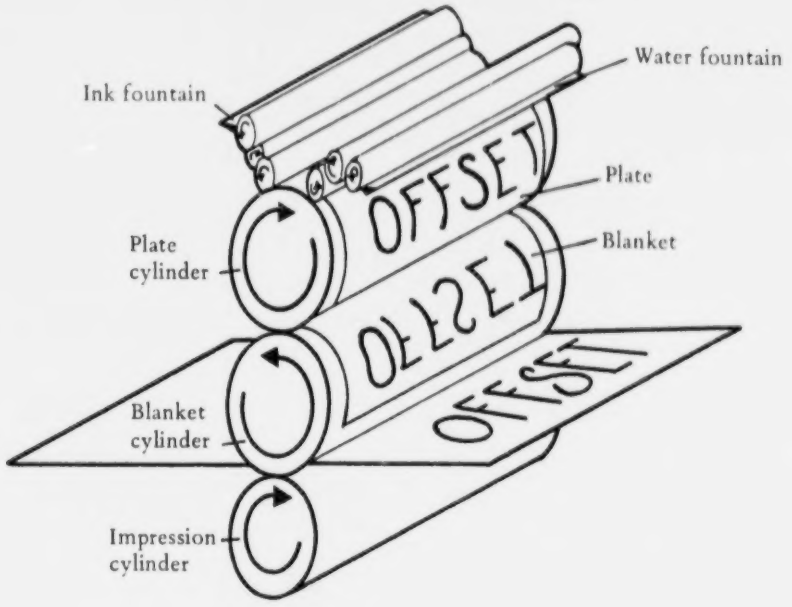


Figure 1

The Offset Press

The schematic drawing of an offset press shows only the basic, fundamental parts of the press. Actual offset presses have a great many more parts. Note that the offset press has three large cylinders:

the plate cylinder on which is mounted the offset plate;
the blanket cylinder, which is covered with a rubber blanket; and
the impression cylinder, which has a smooth metal surface.

There are also two fountains (reservoirs):

the ink fountain, which carries a supply of ink; and
the water fountain, which contains the plate-dampening solution.

Two series of rollers, one from the ink fountain and one from the water fountain, furnish ink and water to the plate.

Paper is fed automatically through the press and stacked neatly after printing.

Offset Process

In the offset process, the printing image can be drawn by hand, typed, or prepared photographically on the surface of the offset plate. This offset plate is then mounted on the plate cylinder of the offset press. During operation of the offset press, the inked image of the offset plate is printed onto the rubber-covered surface of the blanket cylinder. In turn, the blanket cylinder transfers (or "offsets") its printed image onto the paper, which is fed between the blanket cylinder and the impression cylinder.

Inking the plate—When the press is started in motion, the water fountain roller is brought into contact with the plate, coating it with a film of moisture. The water adheres only to the clear area of the plate because the developed image repels the water.

The ink roller next contacts the plate. The ink adheres to the developed image but is repelled by the water-covered clear area. By a carefully controlled feeding of water and ink, the offset plate is successfully inked in only the desired image areas.

Printing—When the rubber-covered blanket cylinder is brought into contact with the plate cylinder, the readable* inked image of the plate prints onto the blanket. The image printed on the blanket is a reverse or mirrored image of the plate image.

Finally, the paper is passed through the press between the blanket and impression cylinders and is printed upon by the blanket—the image being mirrored again and appearing readable on the paper.

Note that the plate does not print on the paper. Instead, the plate prints on the blanket and then the blanket image is transferred (or offset) to the paper, giving us the term "offset printing."

Activities

1. Design and have your instructor approve a form to be printed.

2. Prepare the plate needed for the offset process.

> **▶ Caution**
>
> The offset press should be used only with your instructor's permission and/or presence.

3. Attach the plate to the press and print the required number of copies.

4. Answer the questions on the Student Response Sheet.

*Type matter which can be read normally from left to right is referred to as "readable" or "right-reading;" if type matter is reproduced so it must be read from right to left on the page, it is called "unreadable" or "wrong-reading."

Offset Printing Theory

Name _____

Class/Period _____

1. Explain what is meant by offset printing.

2. Why is the name "offset" used to describe this process?

3. What is the "grease and water" theory as applied to offset printing?

4. Why is a greasy (or fatty) ink used in offset printing?

5. With a dry offset plate on the press, which is applied first—water or ink? Why? What would happen if the other were applied first?

6. Give another name for the image portion of the offset plate.

7. Give at least two names for that portion of the offset plate that carries no image.

8. Suppose the plate image of Figure 1 were reversed, left to right, would the image on the blanket then be readable or wrong-reading? Would the resulting image appear on the paper in unreadable or readable form?

9. Define the following terms as they apply to offset printing.

A. water receptive

B. water repellent

C. ink receptive

D. ink repellent

E. image area

F. clear area

G. printing area

H. nonprinting area

I. blanket

J. ink fountain

K. water fountain

L. water rollers

M. ink rollers

N. impression cylinder

O. readable image

P. wrong-reading image

Q. right-reading image

R. unreadable image

S. mirrored image

(1A) Printing Systems and Processes

Communications

Pictogram, an activity supporting the Graphic Communications concept, is designed for approximately 3 class periods.

Resources Needed

None

Objectives

The student will

understand that all communication is based upon exchange of information;
develop and encode a message using only pictures; and
receive and decode pictograms of other students.

Evaluation Focus

☒ Knowledge	☐ Problem Solving	☒ Attitude
☒ Awareness	☐ Machine/Tool Usage	

Pictogram

Procedure

Key Terms

Sender: person or object initiating communication
Encode: process of transmitting a thought or message (This is done by a sender.)
Decode: process of receiving an encoded message and translating it into thoughts or ideas
Receiver: person or object that a message or thought is intended for (also decodes the message or thought)
Feedback: response from initial receiver to initial sender confirming or asking for clarification of message
Interference: anything that blocks an exchange of communication

Communication, in its most basic form, is the exchange of ideas and information. It takes place between humans and/or machines (human to human, human to machine, machine to machine, machine to human) and also between animals. Animals communicate through sounds and actions. Whether it be the mating call and dance of a loon on a lake or the high-frequency whine of a whale in the ocean, animals also communicate in basic form. But just what is meant by communicating?

Exchange is the key word. Communication is the process used to *exchange* information. The first step in communication is for an idea to be formulated by the person wishing to send the message (or idea). This person is called a *sender*.

To send a message, the sender must decide how the message is to be sent. Three very basic ways of sending messages are to either speak, write, or gesture. No matter how the message is finally sent, it must be *encoded*, or translated into verbal language or written words or gestures. Encoding allows the message to be conveyed in a form that will be understood by the *receiver* (the person/persons for whom the message was sent).

Once a message has been delivered to the receiver, the receiver must decode, or translate, the message into his/her own thoughts. After decoding, the receiver provides the sender with *feedback* on the message, if necessary. Feedback is a return message that states the initial message was understood or needs further clarification. Anything that blocks or obstructs this process is called interference.

Some examples may show how the communication process does, or sometimes does not, work.

The Communication Process

Bob and Joe want to go to a ball game. Bob calls Joe on the phone to say he will pick him up at 7:30. Joe is in a hurry when Bob calls and says "OK," without thinking about what Bob said. Joe shows up at 7:30, and joe claims he's half an hour late. What was the problem?

Basically, Joe was distracted by something else and did not provide the proper feedback. Bob through Joe was agreeing to the 7:30 time and left it at that. Was the exchange of information complete? Did communication take place?

Actually, this is an example of poor exchange and no communication. Interference occurred during the communication attempt. (Joe was in a hurry and didn't process the information correctly.)

Remember the loons earlier? Well, the male loon is ready to take a mate. Using the instincts provided by nature, he calls to the female loons in the area. When one is in sight and returns the call, the dance of the loons begins and nature takes it course. The loon, a simple creature compared to humans, issues a message and waits for the response. The response, or feedback, is received and decoded by the loon to mean things are progressing as should be. While simple in form, communication has taken place.

Or again, today's machines encode messages in either *binary* or *hexidecimal* forms and send data back and forth at unbelievable speeds. However, one wrong number in a program sends a wrong message and communications break down because of the lack of an exchange of correct information.

In simpler terms, communication is the exchange of information. Whether the message is spoken, gestured, printed, or machine transmitted, the receiver must have the same basic perceptual knowledge as the sender. That is, they either have to be able to hear, or see, or read in the same code as the sender.

Developing Pictograms

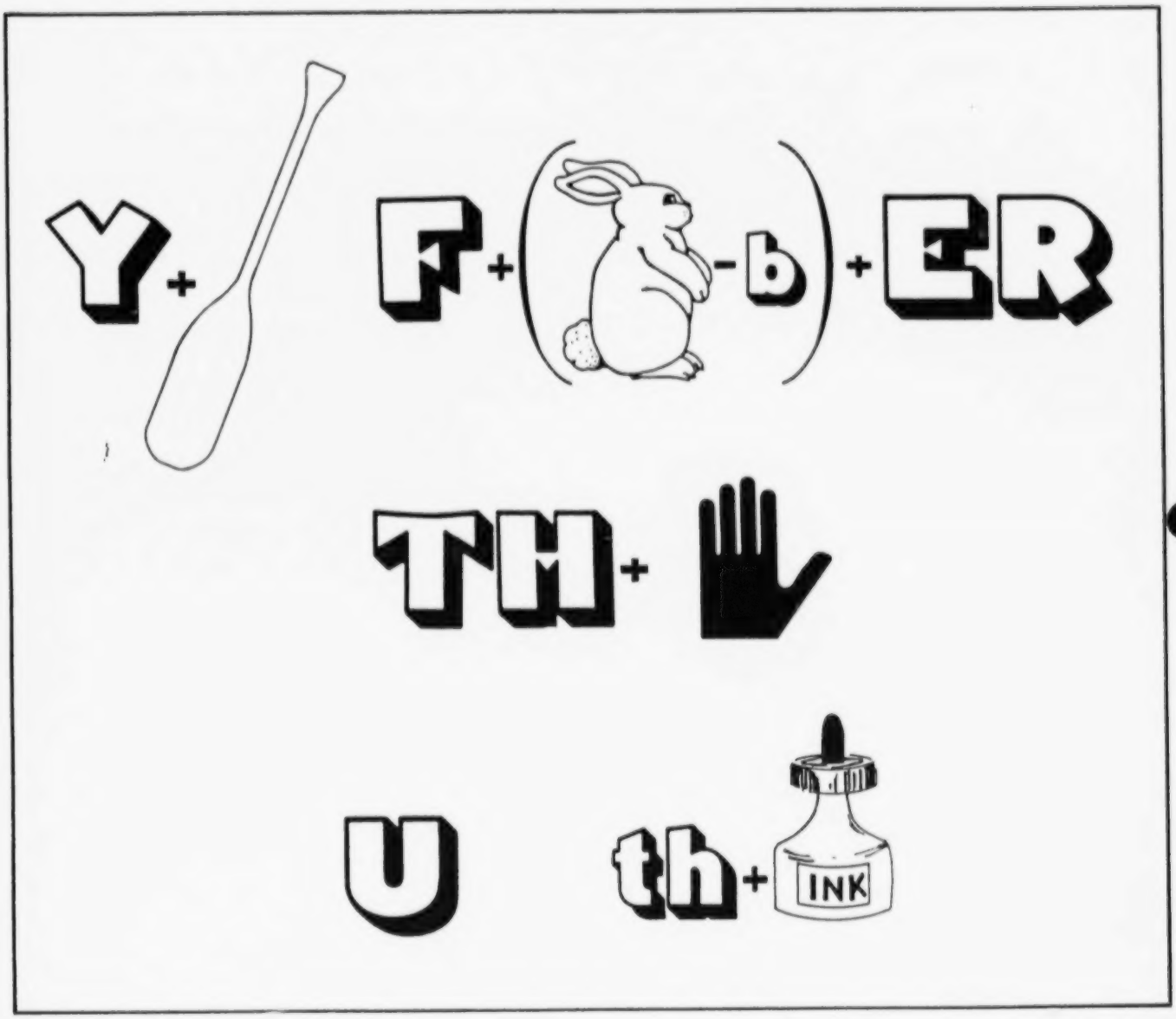
Developing pictograms is one way to demonstrate the key ideas in the communication process.

1. Decode Examples 1 and 2.

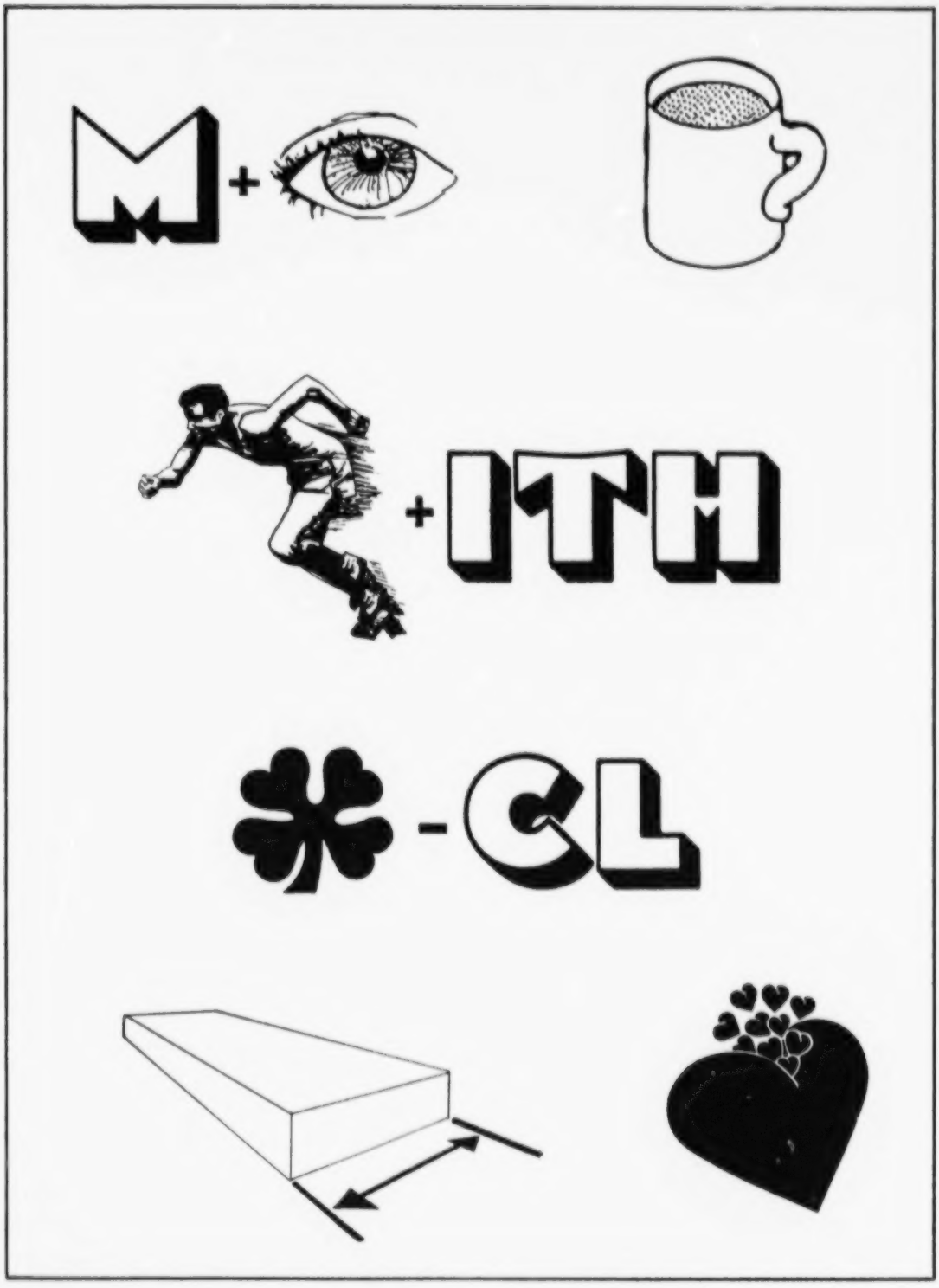
2. Develop your own pictogram. Either draw pictures or perhaps use cut-outs from a magazine.

3. Have the class decode your picture. This will tell you how effectively you communicated your message.

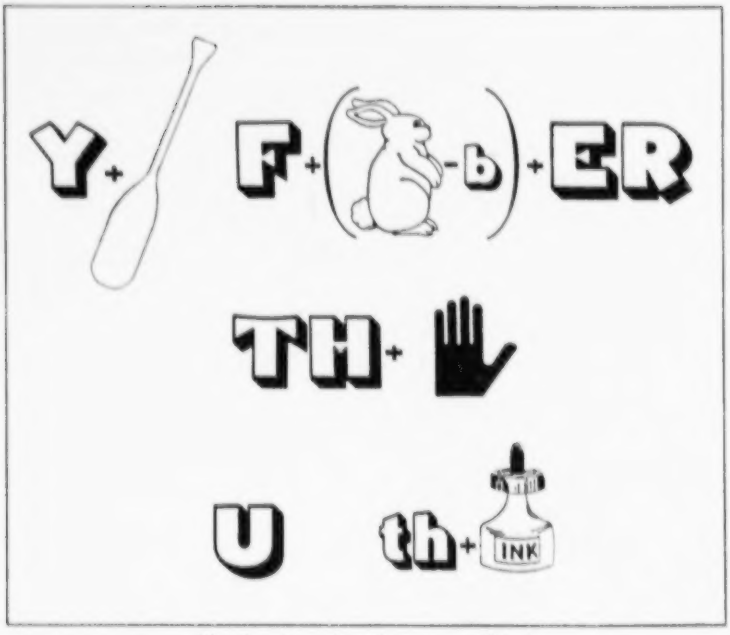
Example 1



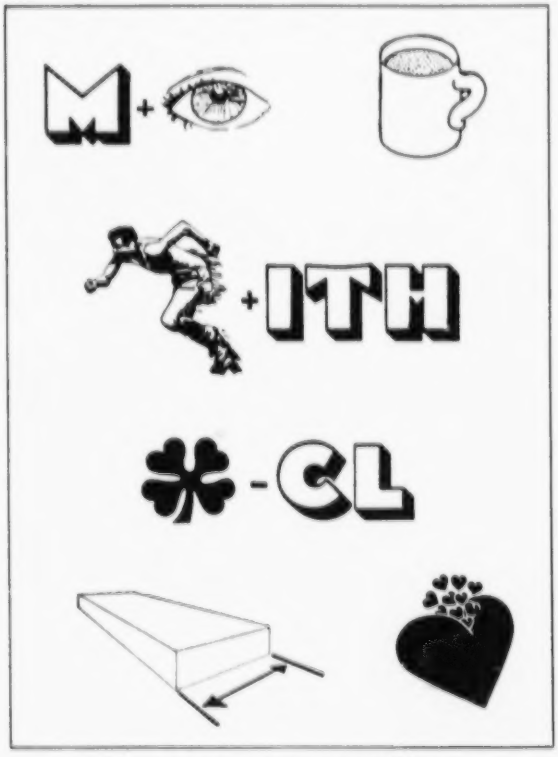
Example 2



Pictogram



You're funnier than you think



My cup runneth over with love

51

(1A) Printing Systems and Processes

Communications

Rubber Stamps, an activity supporting the Graphic Communications concept, is designed for approximately 2 class periods.

Resources Needed

Equipment

Stamp press
Type
Self-centering chase

Materials

Bakelite
Stamp rubber
Molding strips
Rubber cement

Suggested Reference

Broekhuizen, Richard J. *Graphic Communications*. Bloomington, IL: McKnight Publishing Co., 1979.

Objectives

The student will

design and set type;
alter job in composing stick, if necessary; and
produce and mount a rubber stamp.

Evaluation Focus

☒ Knowledge
☐ Awareness
☐ Problem Solving
☒ Machine/Tool Usage
☐ Attitude

Rubber Stamps

Procedure

Rubber stamps are used in homes, businesses, and many other places. They are simple to make and to use. All rubber stamps are made in the same manner. Using these general guidelines, you will produce a rubber stamp for your own use.

General Guidelines

1. Design and letters will not take up more than one inch of molding.
2. You may pick a design or set type for the job.
3. Lock up job, make mold, and mount on molding wood.
4. Return all materials to their proper place.

Specific Instructions

1. Set the type 15 picas wide.
2. Proofread and correct any errors.
3. Lock up your type.

> **▶ Caution**
>
> The stamp press should be used only with your instructor's permission and/or presence.

4. Place type in press and allow to heat for *one* minute.
   (**Note:** Press should be at a temperature of 350 degrees F.)
5. Cut a piece of Bakelite and place *red* side down on the type form.
6. Cover back of Bakelite with paper.
7. Place in press and tighten it until Bakelite touches the top.
8. Wait for *one* minute.
9. Tighten the press and wait for *five* minutes.

10. Remove the press.

11. Gently pry off the Bakelite.

12. Cut a piece of stamp rubber a little smaller than the Bakelite.

13. Place the grey side of the rubber over the red side of the Bakelite. Cover with a piece of paper and place in press.

14. Tighten the press and wait *three and one-half* minutes.

15. Remove from the press and allow to cool.

16. Separate the rubber from the mold.

17. Trim the stamp to size. (Trim as close as possible to the type.)

18. Cut the molding strip to the same size as the rubber.

19. Cement the stamp to the molding strip.

20. Turn in stamp for grade.

21. Answer the questions on the Student Response Sheet.

Rubber Stamps

Name _____

Class/Period _____

1. What kind of type is best for making rubber stamps?

2. Give the heating times for the following:

   A. press

   B. type

   C. matrix

   D. stamp rubber

3. What adhesive is used to adhere stamp rubber to wood?

(1B) Photographic Systems and Processes

Communications

Pin–Hole Camera, an activity supporting the Graphic Communications concept, is designed for approximately 10 class periods.

Resources Needed

Facilities

Photographic laboratory and/or darkroom

Equipment

Print dryer
Contact printer

Materials

Cardboard for camera parts
- 2 pieces 7" x 6"
- 1 piece 6-1/2" x 18"
- 1 piece 4" x 5"
- 1 piece 3" x 3"

Thin-gauge aluminum 1" x 1"
Sand paper (280 grit)
Push-pin
Black marker
Masking tape
Enlarging paper
Photographic paper
X-acto knife

Suggested Reference

Upton, Barbara and John. *Photography*. 6th ed. New York: Little, Brown and Co., 1976.

Objectives

The student will

build a pin-hole camera;
take pictures with it; and
develop the film.

Evaluation Focus

☒ Knowledge	☐ Problem Solving	☐ Attitude
☐ Awareness	☒ Machine/Tool Usage	

Pin-Hole Camera

Procedure

If the photographic process suddenly disappeared from our society, many of our sciences, arts, and social institutions would be unable to function unless the process or a substitute were immediately reinvented. Photography is woven into the fabric of our everyday life. Thousands of careers have been developed around the photographic process--studio photographer, accident investigator, graphic artist, and journalist, for example. Virtually every home in the United States has at least one camera, and yet very few of us know what takes place in the photographic process.

Of all the many inventions of the 19th century—electric lamp, safety pin, dynamite, the automobile, to name just a few—the invention of photography probably created the most astonishment and delight. Today most people take photographs for granted, but earlier viewers were awed and amazed by the detailed images the camera made.

"We distinguish the smallest details; we count the paving stones; we see the dampness caused by the rain; we read the inscriptions on the shop sign. . ." (Author Unknown)

Photography gradually took over what previously had been one of the main functions of art—the recording of factual visual information, such as the shape of an object, its size, and how it related to other objects. Instead of having a portrait painted, people began to have "Sun Drawn Miniatures" made. Instead of forming romantic notions of battles and faraway places from paintings, people began to see first-hand visual reports. Photographs recorded images that the unaided eye could not see and social misery that the eye did not want to see. Photography then began to function as an art in its own right.

The complete photographic process was first developed in the 19th century, yet, basic optical and chemical principles had been known since the time of Aristotle (384-322 B.C.). The tenth-century Arabian scholar Alhazen explained in detail that light rays passing through a pinhole would produce an image. By the time of the Renaissance, a lens had been fitted into a "camera obscura" (literally a "dark chamber" used to view an eclipse of the sun) to improve the sun's image. Camera obscuras were gradually reduced in size from a fixed room to a small tent and finally to a small portable box. They became important to artists who would project the image of their subject onto paper, pencil in the general outlines, and then lay on colors later.

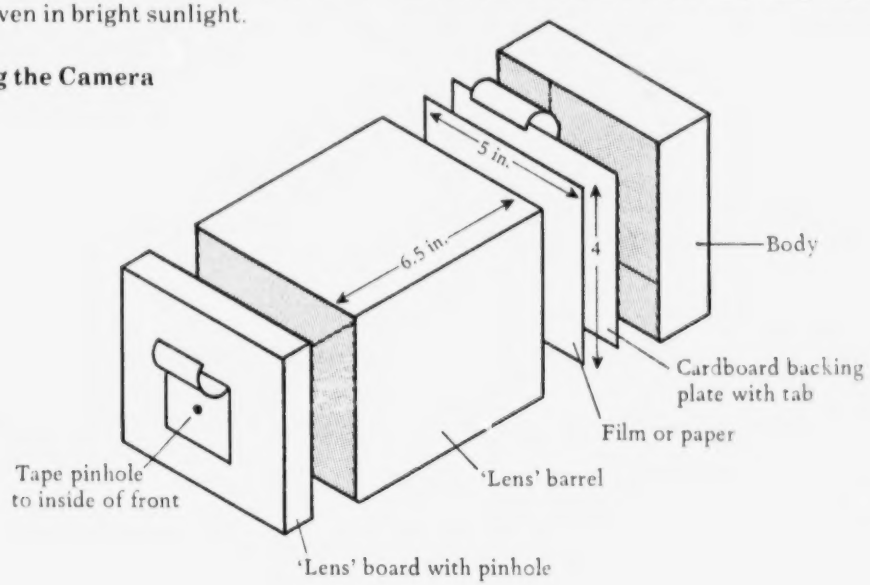
The next step in the development of the photographic process was finding a way to permanently save the image projected into the camera. The darkening of certain silver compounds by exposure to light had been observed as early as the 17th century, but the unsolved and difficult problem was to halt this reaction so that the image would not darken completely.

In 1826, Joseph Nicephore Niepoe of France developed the first true photograph. Niepoe and another Frenchman, Louis Jacques Mande' Darguerre, worked together to further develop photography. Since photography's first development, the process has undergone continual refinement. Today, there are many different types of high quality photographic films and processes.

Black and white photography is one of the easiest photographic processes to learn. Many of the world's most famous photographers choose to use black and white photography because it is said to be a more creative medium than color photography.

The object of this activity is to build and use a pin-hole camera. A pin-hole camera has no lens to collect and focus light rays. The pin hole acts as both the lens and aperture. If the pin hole is small, all points of the image will be sharply in focus. If you make your pin hole too large, the picture will be out of focus. With the correct size pin hole, a very long exposure is needed even in bright sunlight.

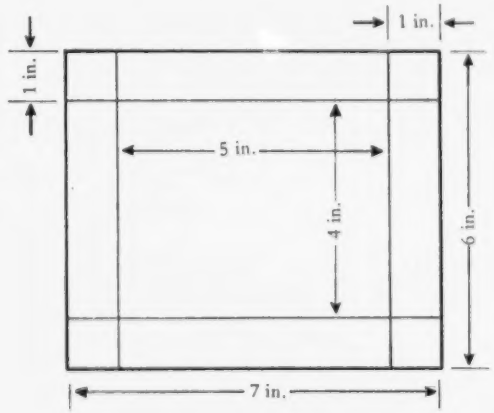
Building the Camera



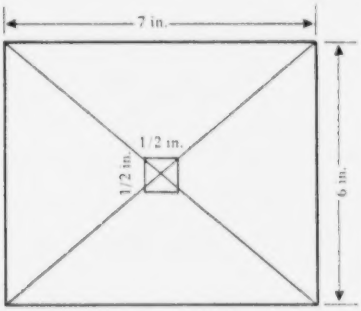
1. Your pin-hole camera will have three main parts--the body, a four-sided box to hold the film; the "lens" board, another four-sided box with the pin hole; and the "lens barrel", a rectangular tube open at both ends to connect the body and lens board. Study the diagram.

2. Obtain two pieces of 7" x 6" cardboard and one piece of 6-1/2" x 18" cardboard for camera parts.

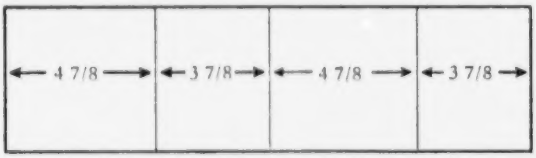
3. The camera parts must fit snugly together when completed so that light does not get in either end. It is important, then, that all measurement be exact. Lay out the fold lines for the body and lens board as shown in the diagram below. Use a pencil and ruler.



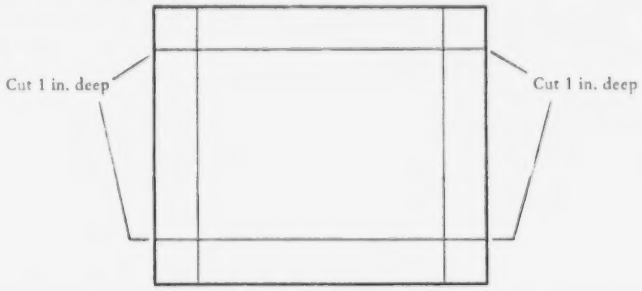
4. On the back side of the camera body and the lens board draw two diagonal lines from corner to corner. Then draw a 1/2" square box in the middle.



5. Lay out the fold lines for the lens barrel as shown in the diagram below. Use a pencil and ruler. Markings must be exact.



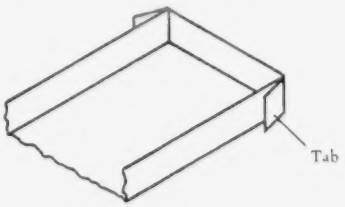
6. Use scissors to make four cuts for corner folds on both the camera body and lens board pieces. Do not cut beyond 1" line or your camera will have light leaks.



7. Use an X-acto knife and ruler very lightly to cut part way into the cardboard at each fold line. If properly done, this will make folding the camera parts easier. If you cut too deep, you will destroy the camera parts. **Note:** Do not cut the X lines or the 1/2" box on the back side of the camera body and lens.

8. Carefully bend the lens barrel into a rectangular shape, and tape and seal the seam together with masking tape. Use tape the entire length of the seam—inside and outside.

9. Carefully bend the sides on the body and lens board. Use masking tape to tape the tabs to the *outside* of the edges.



10. Fit both body and lens board onto the lens barrel to see which one fits tightest. The one that fits best should be used as the camera body.

11. Use the one that fits less tightly as the lens board because it will be taped on permanently later. Using an X-acto knife, cut the 1/2" hole from the center of the lens board.

12. Obtain one each of:
    1" x 1" thin-gauge aluminum
    4" x 5" cardboard
    3" x 3" cardboard
    280-grit sandpaper

13. Use a push-pin to make a small "pin hole" in the center of the thin-gauge aluminum. It is important to make a *small, round* hole. Use just the tip of the pin. Once the tip of the pin has made a hole, stop. *Do not* enlarge the hole by pushing the pin further in. Twisting the pin will help make a rounder hole, so twist the pin as you ease it through the metal.

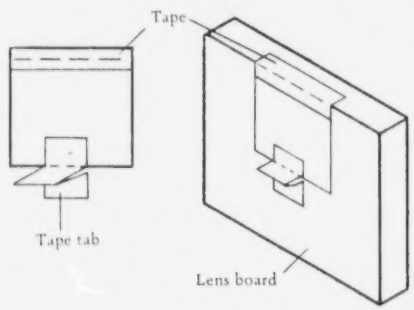
14. Use the abrasive paper to sand the jagged edge off the hole. After sanding, twist the push-pin tip in the hole to clean and round the hole.

15. Use a black marker to blacken both sides of the metal.

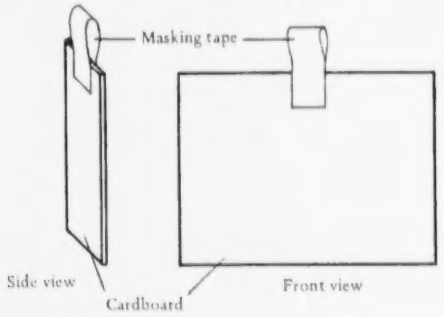
16. Use masking tape to tape the metal to the inside of the lens board. Center the pin hole, and tape around all four sides of the metal so there are no light leaks.

17. Use a black marker to blacken the tape on the inside of the lens board.

18. The 3" x 3" cardboard square will be used as a shutter. Use masking tape to make a tape tab and also to tape it into position along the top edge of the lens board. See diagram below.



19. The 4" x 5" cardboard will be used as a backing plate behind your film. Make a tab with masking tape. See diagram below. This backing plate will make it easy to remove your photo film after taking a picture.



20. Tape the lens board and lens barrel together with masking tape to seal all four sides.

21. Place the camera body on the other end of the camera barrel, and your camera is now complete.

Using the Camera

1. Obtain a packet of enlarging paper packaged in a light-tight bag. Do not lose this bag—you will check it back in later.

2. You are now ready to start taking pictures with your pin-hole camera. The "film" you will be using will be the photographic enlarging paper.

3. To load your camera, you must be in total darkness or under "safelight" conditions. To load, remove the body from the lens barrel. Place the cardboard backing plate inside the body (with tab showing). Position a sheet of photographic paper on top of the backing plate making sure the emulsion side (shiny side) is facing out.

4. Place the camera body back on the lens barrel. Your camera is loaded and ready to take a picture. Before going out into room light, make sure your shutter is closed.

5. To take a picture, the camera must be held perfectly still during exposure time. Some people like to put the camera on the ground or on a table, fence post, or hood of a car. Whatever method you use, the camera must not move once the shutter is opened.

6. Exposure time (the amount of time the shutter is left open) is best determined by trial and error because pin-hole cameras are so variable. The amount of time will be affected by the type of enlarging paper used, the size of your pin hole, the amount of light available (full sun, cloudy, indoors, etc.), the size and construction of your camera, etc.

Roughly, enlarging paper will need an exposure of a few minutes in bright sunlight, eight to 20 minutes in cloudy bright daylight, ten to 30 minutes in full clouds, and as much as 60 minutes in low light situations.

7. To compose a picture that you want to take, set your camera so it will not move. Aim the pin hole at the center of the picture. Open the shutter. Time the exposure. Close the shutter. You have just taken a photograph.

Developing the Pictures

1. **Note:** Do not remove the enlarging paper from the camera unless under safelight conditions or total darkness. Using regular darkroom techniques, develop the picture.

2. After washing, place the print in the print dryer (emulsion side toward canvas), and let dry (approximately five to ten minutes).

3. Once developed, the photograph will be a "negative." Light areas from the scene will be dark in the photo, and dark areas will be light. If the total photograph is light, you need a longer exposure time when taking the picture. If the total photograph is dark, you need a shorter exposure time. If you have a wide range of tone from white to black, you have a properly exposed photograph.

4. Once you have a properly exposed photograph, make a "positive." This is done in the darkroom under safelight conditions.

5. Place the "negative" on the contact printer face up.

6. Place a piece of unexposed enlarging paper on top of the "negative" and in contact with it (emulsion to emulsion).

7. Place the felt pad on top, and close the lid of the contact printer.

8. Set the timer for one second and expose.

9. Remove the exposed positive, and process normally in the photo chemicals.

10. After washing, place the print in the print dryer (emulsion side toward canvas), and dry, again approximately five to ten minutes.

11. Neatly print your name and folder number on the back side of each photo. Place all pictures inside your pin-hole camera, and return everything—including the light-tight bag—to your instructor.

(1C) Graphic Industry Products

Communications

Reading Mechanical Drawings, an activity supporting the Graphic Communications concept, is designed for approximately 2 to 3 class periods.

Resources Needed

None

Objectives

The student will

identify the various drawing symbols and lines commonly used in contemporary design systems; and

display understanding of sample mechanical drawings.

Evaluation Focus

☒ Knowledge	☒ Problem Solving	☐ Attitude
☐ Awareness	☐ Machine/Tool Usage	

Reading Mechanical Drawings

Procedure

Mechanical and architectural drawings use a code (symbols and lines) to properly convey meaning. Architectural drawings are used extensively to communicate ideas about structures. Offices, factories, homes, cities, and road systems are all planned with the use of such drawings.

Mechanical drawings are used to communicate information about objects other than structures. Information is needed to make components and to fabricate the many products manufactured. In a technological society, communications are conveyed by way of drawings. In this activity, you will learn to recognize some of the components of the communication code used in mechanical drawings.

Read the definitions of the following types of lines and look at the example of how the lines are used on the "Examples of Basic Lines" page.

Basic Lines

Border line—A heavy solid line. It is used as a border or a frame for a drawing.

Visible lines—The lines used to show the parts of an object that can be seen from the position drawn.

Construction line—A very thin, light line used to lay out a drawing.

Section line—A thin, evenly spaced line drawn at a 45-degree angle along the cutting line of a sectioned drawing.

Hidden line—A broken line used to show the parts of an object that are hidden from view in the position where the object is being drawn. It indicates unseen object lines, edges, or surfaces.

Centerline—A line used to show the center of an arc, half circle, or full circle. Centerlines divide drawings into equal, symmetrical parts.

Dimension line—Thin, solid line used to indicate the distance from one point to another of an object. There is always an arrowhead on one or both ends of this line.

Extension line—Line that extends out from the drawing of the object to show the points from which the dimensions are taken. Extension lines do not touch the object.

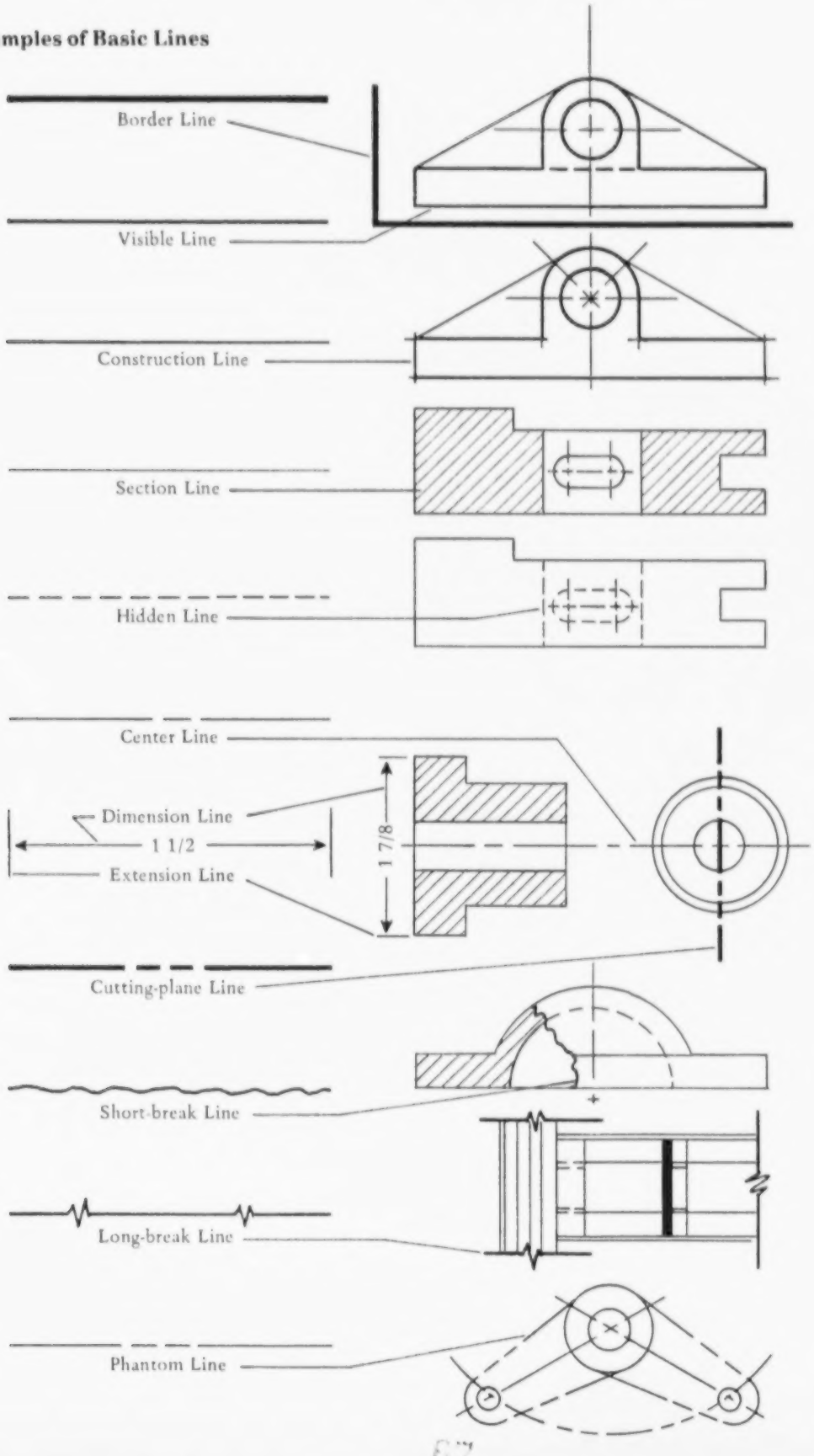
Cutting plane line—A heavy line made of two short dashes and a long dash repeated. It shows where an object has been sectioned. The lines end in arrowheads which show the direction you are looking.

Short break line—A medium-heavy, wavy line drawn freehand and used to show a small portion of the inside detail of a complicated part. No cutting plane line is used. An uneven line on the view shows an outer surface has been cut away.

Long break line—This medium-weight ruled line has free-hand zig-zags. It is used to show a break in the object, because it is too big to be put on the page. The long break line is used to shorten the length of the object.

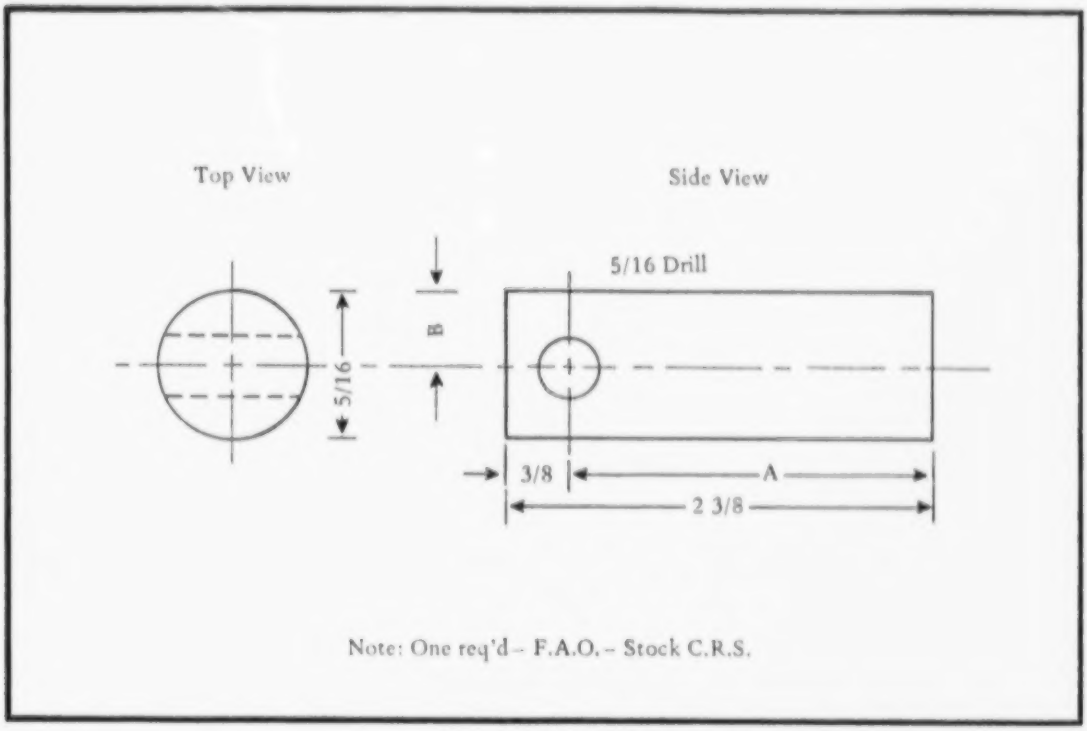
Phantom line—Used on drawings to show the position of parts next to the object being drawn or the possible positions of moving parts.

Examples of Basic Lines

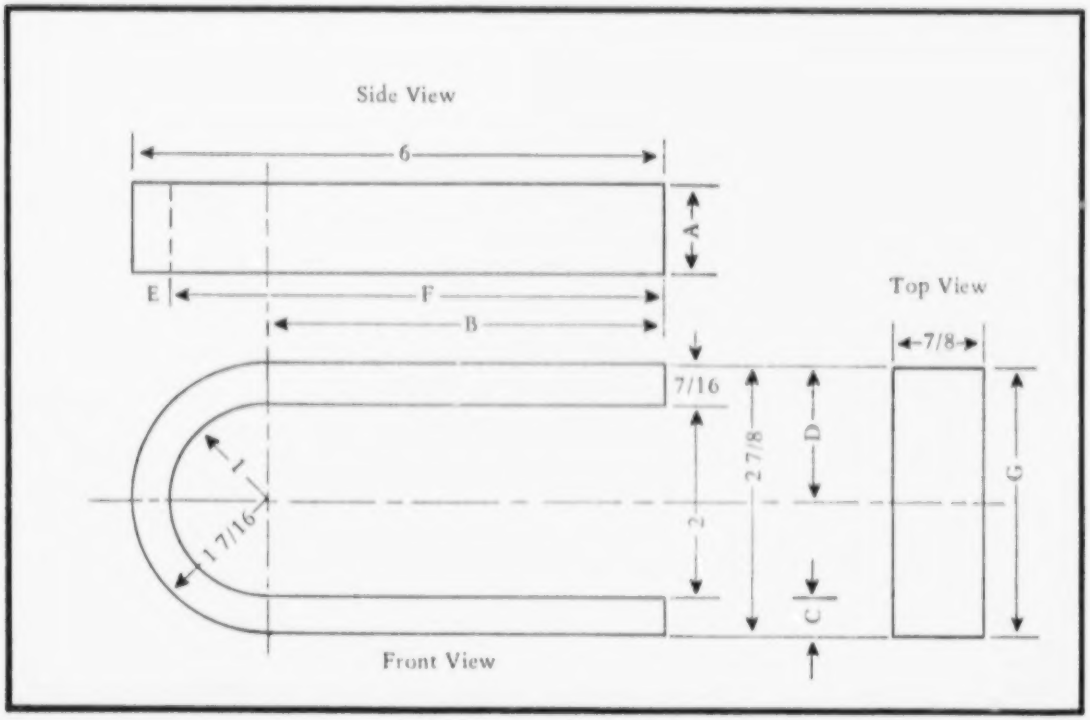


Drawing Interpretation Problems

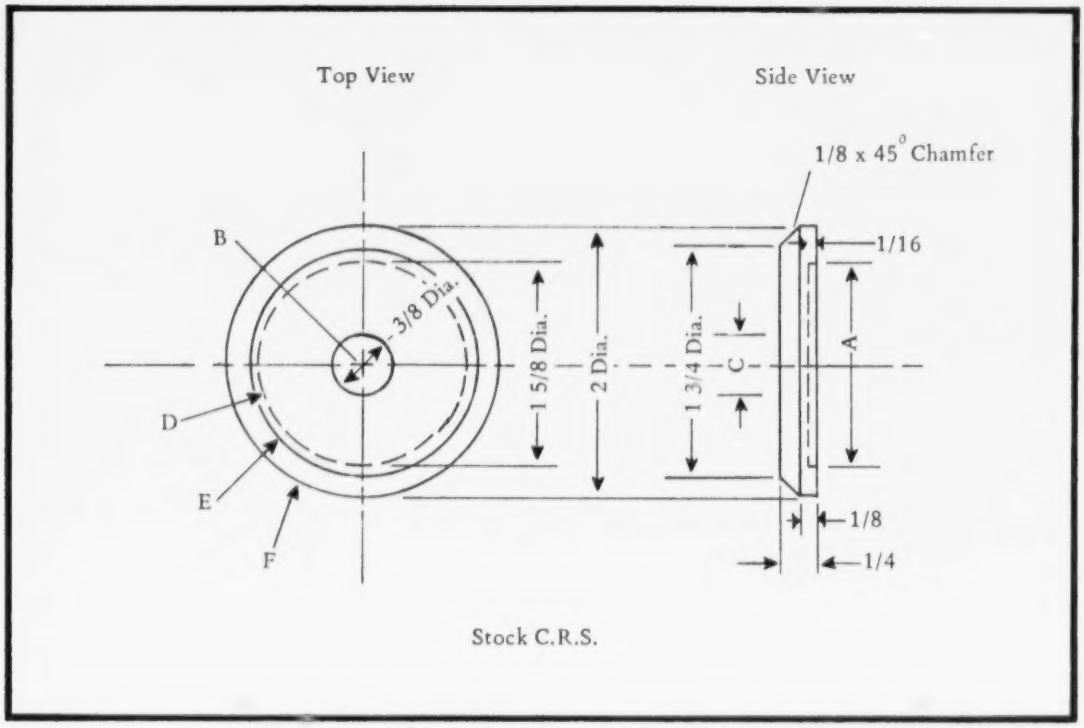
Study the series of drawings and answer the questions about each one on the Student Response Sheet.



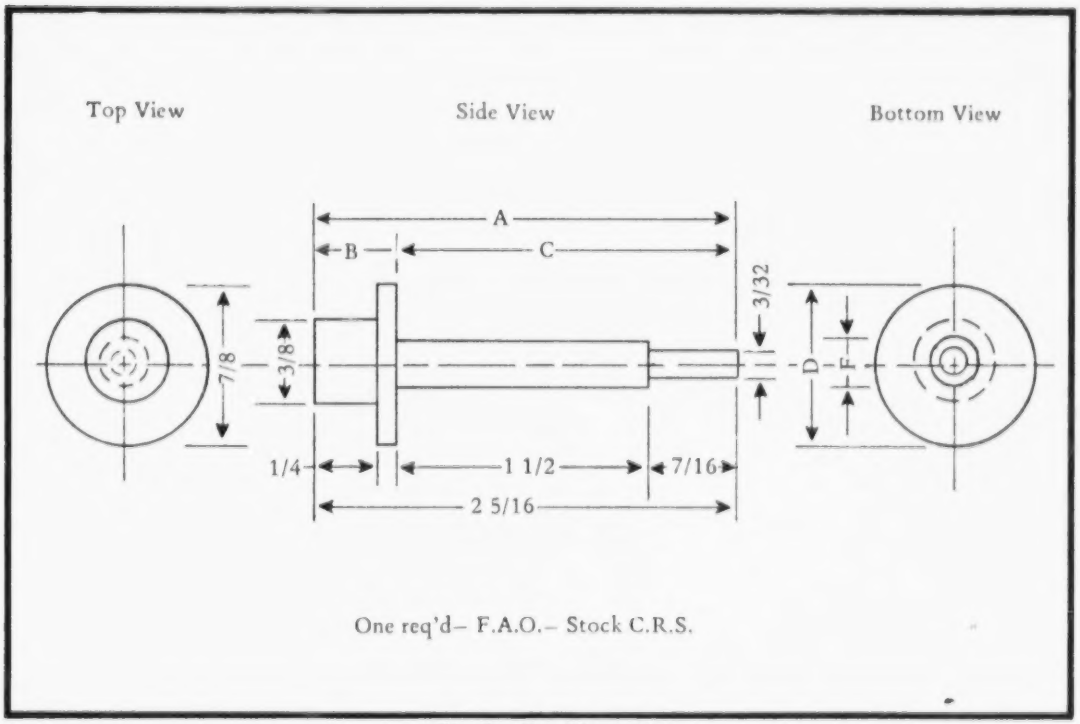
Pin (Problem 1)



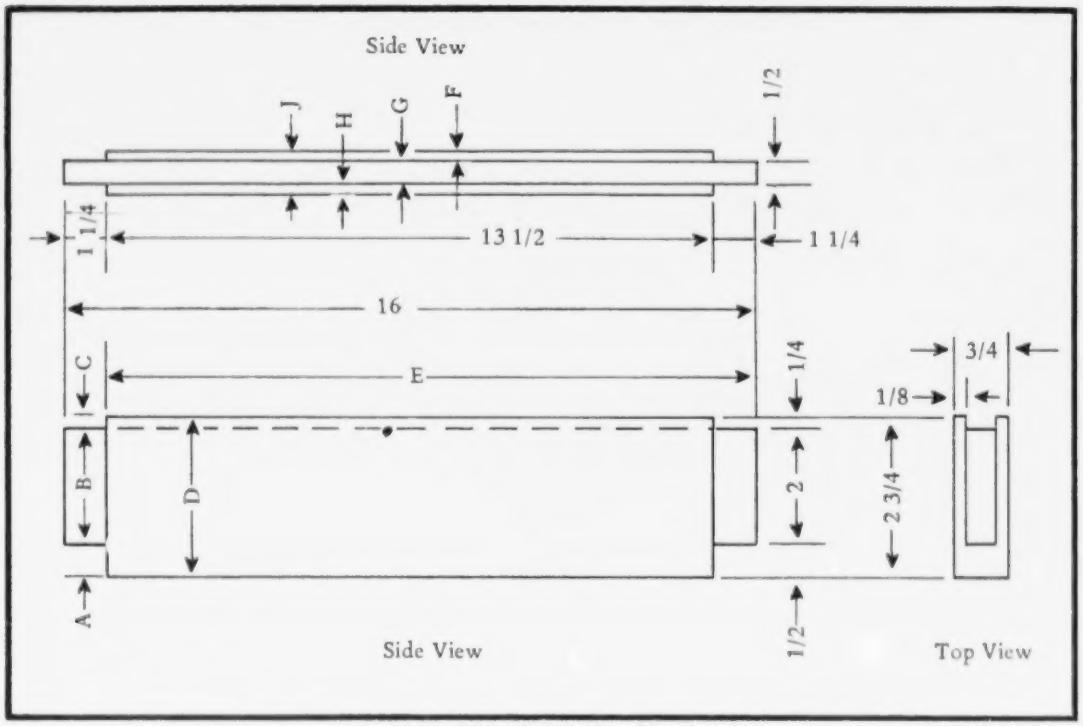
U-Magnet (Problem 2)



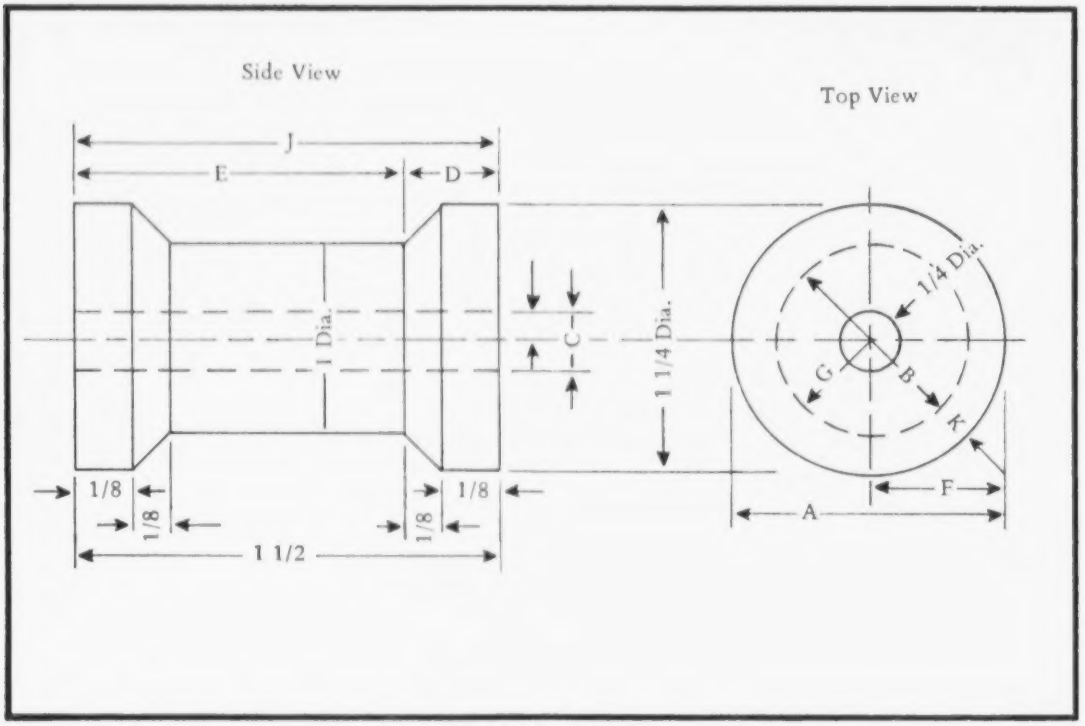
Cover Cap (Problem 3)



Shaft (Problem 4)



Cabinet Side Rail (Problem 5)



Spool (Problem 6)

Questions For Drawing Interpretation Problems

Pin (Problem 1)

1. What is the length of the pin?

   A. 9/16
   B. 2-5/8
   C. 2-1/4
   D. None of the above

2. What is the diameter of the pin?

   A. 3/8
   B. 5/16
   C. 9/16
   D. 9/32

3. The correct dimension for A is?

   A. 3/8
   B. 2-5/8
   C. 2-1/4
   D. 2-1/8

4. The correct dimension for B is?

   A. 9/16
   B. 5/16
   C. 3/8
   D. 9/32

5. At what radius would the compass (drawing instrument) be set in drawing a 5/16 diameter circle?

   A. 5/16
   B. 3/8
   C. 5/64
   D. 5/32

U-Magnet (Problem 2)

6. How long is the magnet?

   A. F
   B. 6
   C. G
   D. 5

7. What is the correct dimension for A?

   A. 7/16
   B. 3/4
   C. 1/2
   D. 7/8

8. For B?

   A. 4-9/16
   B. 4-1/2
   C. 5
   D. 4-7/16

9. For C?

   A. 7/16
   B. 7/8
   C. 7/32
   D. 3/8

10. For D?

    A. 2
    B. 1-7/32
    C. 1-7/8
    D. 1-7/16

11. For E?

    A. 3/8
    B. 7/32
    C. 7/16
    D. 1/2

12. For F?

    A. 5-9/16
    B. 6
    C. 4-5/8
    D. 5

13. For G?

    A. 2-7/16
    B. 2
    C. 2-7/32
    D. 2-7/8

14. What does the R represent in 1R and 1-7/16R from the front view of the drawing?

    A. Round
    B. Radial
    C. Radius
    D. Removed

Cover Cap (Problem 3)

15. The cover cap is made of?

    A. Aluminum
    B. Stainless steel
    C. Carbon raided steel
    D. Cold rolled steel

16. The overall size of the cover cap is?

    A. 1/4 by 15/8 dia.
    B. 1/8 by 2 dia.
    C. 1/4 by 2 dia.
    D. 1/8 by 15/8 dia.

17. The hole in the center of the cover cap is?

    A. 3/16 dia.
    B. 3/16 radius
    C. 5/8 dia.
    D. 3/8 radius

18. The chamfer on the edge of the cover cap is?

    A. 1/8 by 45 degrees
    B. 1/4 by 45 degrees
    C. 1/4
    D. 1/8

19. The correct dimension for A is?

    A. 1-3/4
    B. 1-2/16
    C. 2
    D. 1-5/8

20. For B?

    A. 3/8 dia.
    B. 1 dia.
    C. 1/2 radius
    D. 1 radius

21. For D?

    A. 2 dia.
    B. 1-5/8 dia.
    C. 7/8 radius
    D. 1 radius

22. For E?

    A. 2 dia.
    B. 2-5/8 dia.
    C. 1-3/4 dia.
    D. 1-5/16 radius

23. For F?

    A. 2 dia.
    B. 1-5/8 dia.
    C. 1-3/4 radius
    D. 1-5/16 radius

24. What is the radius for D?

    A. 3/4 radius
    B. 13/16 radius
    C. 7/8 radius
    D. 15/6 radius

Shaft (Problem 4)

In this problem, two side views are shown. This plan is commonly used in industry to make the drawing clearer and easier to read.

25. The abbreviation "req'd" means required?

    A. True
    B. False

26. What does the abbreviation "FAO" mean?

A. Flat is original
B. Face after oiling
C. Finish all over
D. Fragile after operations

27. What does the abbreviation "CRS" mean?

A. Carbon raised steel
B. Cold rolled steel
C. Carbon reinforced steel
D. Cobolt removed steel

28. Why is there no top view given?

A. It is not needed.
B. It could not be drawn true size.
C. It is there.
D. None of the above

29. What is the correct dimension for A?

A. 3
B. 2-5/8
C. 2-5/16
D. 2

30. For B?

A. 1/4
B. 1/8
C. 3/16
D. 3/8

31. For C?

A. 1-15/16
B. 2
C. 1-7/8
D. 1-1/16

32. For D?

A. 1
B. 7/8
C. 5/8
D. 15/16

33. For E?

A. 1/2
B. 5/32
C. 3/8
D. 7/8

34. For F?

A. 5/32
B. 1/4
C. 3/8
D. 5/16

Cabinet Rail Problem (Problem 5)

35. This job would require a piece of stock the size of?

A. 3/4 by 2-1/2 by 16
B. 3/4 by 2-3/4 by 16
C. 1/2 by 2-1/2 by 16
D. 1/2 by 2-3/4 by 16

36. What is the correct dimension for A?

A. 1/2
B. 2-3/4 dia.
C. 2 dia.
D. 1/4

37. For B?

A. 2-3/4
B. 2-1/2
C. 3/4
D. 2

38. For C?

A. 1/2
B. 2-1/4 dia.
C. 3/4
D. 1/4

39. For D?

A. 2-3/4
B. 2-3/4 dia.
C. 2-1/2
D. 2

40. For E?

A. 1-1/4
B. 16
C. 13-1/2
D. 14-3/4

41. For F?

A. 1/4
B. 1/16
C. 1/8
D. 3/4

42. For G?

A. 1/2
B. 1/4
C. 1/8
D. 3/16

43. For H?

A. 1/4
B. 1/16
C. 1/8
D. 3/4

44. For J?

A. 1/2
B. 3/4
C. 5/8
D. 7/8

Spool (Problem 6)

45. What is the correct dimension for A?

A. 1-1/4 dia.
B. 1-3/4 dia.
C. 1-1/2 dia.
D. 1-1/8 dia.

46. For B?

A. 1 dia.
B. 3/4 dia.
C. 1/4 dia.
D. 1-1/4 dia.

47. For C?

A. 1/2
B. 3/4
C. 1/4
D. 3/4

48. For D?

A. 1/4
B. 1/8
C. 1/2
D. 1/16

49. For E?

A. 1-1/4 dia.
B. 1-1/4
C. 1-1/2
D. 1-1/2 dia.

50. For F?

A. 1-1/8 dia.
B. 7/8 radius
C. 1-1/4 dia.
D. 5/8

51. For G?

A. 1 dia.
B. 7/8 dia.
C. 1/2 radius
D. 5/8 radius

52. For H?

A. 1/4 dia.
B. 1/4 radius
C. 1/8 radius
D. 1/2 dia.

53. For J?

A. 1-1/4 dia.
B. 1-1/4
C. 1-1/2
D. 1-1/2 dia.

54. For K?

A. 1/2 dia.
B. 1/8 dia.
C. 1/8
D. 1/4

55. The top view should have been drawn to show the spool more clearly?

A. True
B. False

Reading Mechanical Drawings

Name _____

Class/Period _____

Print capital letter A, B, C, D.

Pin (Problem 1)

1. _____
2. _____
3. _____
4. _____
5. _____

U-Magnet (Problem 2)

6. _____
7. _____
8. _____
9. _____
10. _____
11. _____
12. _____
13. _____
14. _____

Cover Cap (Problem 3)

15. _____
16. _____
17. _____
18. _____
19. _____
20. _____
21. _____
22. _____
23. _____
24. _____

Shaft (Problem 4)

25. _____
26. _____
27. _____
28. _____
29. _____
30. _____
31. _____
32. _____
33. _____
34. _____

Cabinet Rail Problem (Problem 5)

35. _____
36. _____
37. _____
38. _____
39. _____
40. _____
41. _____
42. _____
43. _____
44. _____

Spool (Problem 6)

45. _____
46. _____
47. _____
48. _____
49. _____
50. _____
51. _____
52. _____
53. _____
54. _____
55. _____

Reading Mechanical Drawings

Key

Pin (Problem 1)

1. B
2. C
3. C
4. D
5. D

U-Magnet (Problem 2)

6. B
7. D
8. A
9. A
10. D
11. C
12. A
13. D
14. C

Cover Cap (Problem 3)

15. D
16. C
17. B
18. A
19. D
20. D
21. B
22. C
23. A
24. B

Shaft (Problem 4)

25. A
26. C
27. B
28. A
29. C
30. D
31. A
32. B
33. C
34. B

Cabinet Rail Problem (Problem 5)

35. B
36. A
37. D
38. D
39. A
40. D
41. C
42. A
43. C
44. B

Spool (Problem 6)

45. A
46. A
47. C
48. A
49. B
50. B
51. C
52. C
53. C
54. C
55. B

(1C) Graphic Industry Products

Communications

Satellite Newspaper, an activity supporting the Graphic Communications concept, is designed for approximately 3 class periods.

Resources Needed

Copies of *USA Today* newspaper

Objectives

The student will

locate the various sections of a national newspaper; and
explore how national, regional, and local news can be formulated via satellite into a newspaper serving national and local markets.

Evaluation Focus

☐ Knowledge	☐ Problem Solving	☐ Attitude
☒ Awareness	☐ Machine/Tool Usage	

Satellite Newspaper

Procedure

The *USA Today*, though it has only been on the newsstands for a short time, has revolutionized how a major newspaper is prepared. It combines various types of communication into a neat package that makes use of new technology. *USA Today* is the first national newspaper to include regional and state information relayed to the publisher by satellite. It is edited and prepared for printing by the publisher and then sent back to local printers, again by satellite, to be printed and distributed locally. In this activity you will be studying the functional parts of the paper and how they form a national newspaper that is also a local paper.

1. Obtain a copy of *USA Today*.

2. Using the newspaper, answer the questions on the Student Response Sheet.

Satellite Newspaper

Name _____

Class/Period _____

Front Page

1. What is the headline?

2. Give the title and the brief summary of the cover story.

3. Where is the table of contents located, and what is its purpose?

State-by-State

4. At what page and section letter did you find the state-by-state section?

5. Locate the Wisconsin news section and provide a brief summary of the article.

Weather

6. On what page and section is the weather section found?

7. Summarize the weather for the Midwest.

8. What are the four-day highlights for Eau Claire, Wis.?

9. What is the phone number for finding out local weather information in the Minneapolis/St. Paul area (as found in the area weather close-up)?

Money

10. What is the section letter for the money section?

11. What is the high for Cray Research (Cray Rs) in the New York Stock Exchange (NYSE)?

12. Summarize what the "Industry Spotlight" is about.

Sports

13. Summarize the lead story found under the sports headline.

14. Write a brief summary of the sports cover story.

15. Write a brief summary of the Wisconsin sports (as found in "Across the USA in Sports").

Life

16. Locate the "Lifeline" section, and summarize what is happening as far as "trends" go.

17. In the Lifeline section, locate and summarize the feature entitled "USA Snapshots."

Advertising

18. Locate, list the page number and section letter, and summarize a major advertisement located anywhere in the newspaper.

19. What is the purpose for advertising as far as the newspaper goes?

(1C) Graphic Industry Products

Communications

Trademark/Logo Design, an activity supporting the Graphic Communications concept, is designed for approximately 2 to 3 class periods.

Resources Needed

None

Objectives

The student will

learn about the types and purposes of trademarks/logos;
understand positive design qualities;
design trademarks;
develop rough and comprehensive layouts; and
prepare camera-ready copy of the new trademarks.

Evaluation Focus

☒ Knowledge	☐ Problem Solving	☐ Attitude
☐ Awareness	☐ Machine/Tool Usage	

Trademark/Logo Design

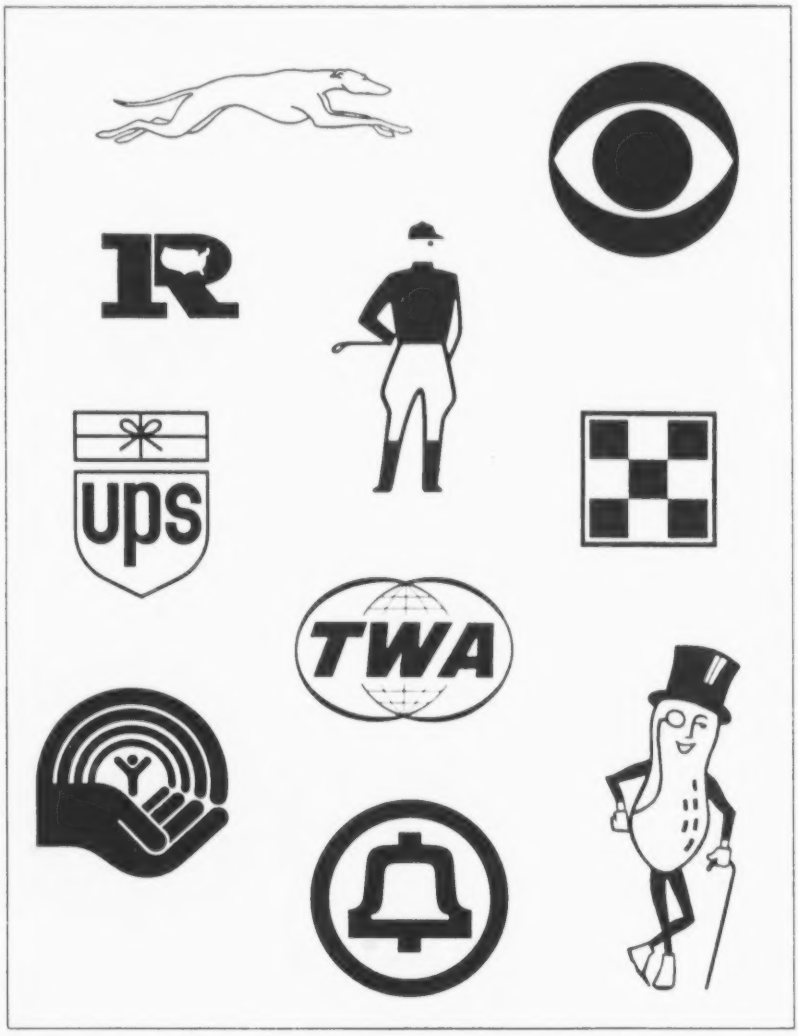
Procedure

Purposes of Trademarks/Logos

Originally trademarks were used to identify products only. However, over the years the uses for trademarks have grown to include identification of organizations, corporations, companies, institutions, and services.

Designed correctly, trademarks can be an extremely powerful tool—95 percent of the people in the United States would be able to immediately recognize the McDonald's trademark. In fact, more people probably know the McDonald's trademark than the name of the President of the United States.

How many of these trademarks can you identify?



If you were able to identify between seven and ten of the trademarks, consider yourself a normal, alert human being. The symbols you have been asked to identify are called trademarks or logos. (For all practical purposes, trademarks and logos are the same thing. From this point on, only the word "trademark" will be used to prevent confusion.)

Quite often a trademark can mean the difference between success and failure. The Sun Oil Company was an old business with virtually no growth over a 20-year period. The company decided that they either should begin updating and growing or they should go out of business. In order to stimulate growth, they decided to design a new trademark. The new trademark consisted of the word SUN with a sunrise in the background. They put their new trademark on company stationery, business forms, and on their huge oil storage tanks around the country. Primarily due to their new trademark, they were able to create a fresh, positive company image of youth, strength, and honesty. People began to take notice of the Sun Oil Company, and business has been growing.

Types of Trademarks

Trademarks can be classified into three general groups: descriptive, symbolic, and typographic. These three types of trademarks can be found individually or combined. Examples of all three types are given later.

Descriptive trademarks are those that visually describe an organization's product. These trademarks are generally used with companies that produce only one type of product. This type of trademark can be effective in fostering immediate recognition of an organization and its product. The trademark should be simple and easily recognizable. An example of a descriptive trademark is shown on the right. This trademark belongs to Barnards wire fencing. The mark is based on the basic twisting feature common to all wire fencing. There are disadvantages to descriptive trademarks. If a trademark design is based on a product, it automatically excludes any other unrelated product that may be developed in later years. It is generally not a good idea to change trademarks once people have been exposed to them over a period of time because the organization could lose its identity. An attempt to design a trademark that includes several products seldom produces satisfactory visual results.

Another disadvantage of using a descriptive trademark may be the problem of outdating products. Consider a company that originally began producing aircraft engines and designed their trademark using a piston. Now, in later years, they develop and almost exclusively sell jet engines, which do not operate with pistons. This company's trademark is now outdated and does not represent the product that the company produces. A lot of jet engine sales can be lost because prospective buyers associate this company with aircraft piston engines and not jet engines. Generally, it may be better to design trademarks that suggest the character of an organization (symbolic or typographic mark) rather than its products.

Symbolic trademarks may be more appropriate than descriptive trademarks, especially for organizations that provide skills, services, information, or a wide variety of products. An example of a symbolic trademark is the trademark of wool products. This symbol conveys admirable qualities of wool in one simple design. The wool trademark associates a natural raw material with craft qualities of hand-knitting.

Another common symbolic trademark is the one owned by the United Way. This trademark conveys an important message in a simple way: Please help us lend a helping hand to those who are in need of assistance and help bring a little sunshine and joy into their lives. If a symbolic trademark is designed correctly, it will provide a positive message and immediate recognition. The key to a well-designed symbolic trademark is to list as many desirable qualities and characteristics of an organization, product, or service as possible and incorporate them into one simple design.

Symbolic trademarks also may be just a simple design that projects no messages or special qualities. Sometimes it is best to design a trademark that is nothing more than an easily recognizable symbol. An example of this is the Chrysler Corporation's trademark.

Typographic marks make use of letter forms. Letter forms can be a word or words, initials, or just a special letter. The letters in typographic marks do not have to be recognizable (readable) to produce a design that will leave an impression on people's minds. An example of a typographical trademark is shown on the right. Typical letter uses on trademarks include distorting organizational initials, modifying letter shapes, or creating original letter shapes to develop exciting trademarks.

Typographical marks are probably the most common form of trademark used throughout the world. Designers of typographic marks try to incorporate positive characteristics of their products, services, and/or organization by the manipulation of letters. When letters are used in a trademark, the design must provide a feeling of unity and continuation. This is achieved by eliminating any letter designs that may cause a visual distraction. Distractions could result in only part of the design being seen and remembered. Typographic trademarks depend on the eye viewing all the letters of the design from left to right smoothly with no interruptions. Any distractions in the design could result in a failure to communicate.

Design Considerations

Before exploring possible trademark designs, it usually is necessary to first research the organization, product, or service. This research will help to identify the purpose of the trademark and the positive qualities to be incorporated in its design. Typical questions to answer before any design takes place might be:

1. What is the anticipated audience for the trademark (local, national, international, worldwide)?
2. Will the mark be used with any other existing marks, take the place of other existing marks, or be entirely new?
3. Is the mark to be used for a product, service, or organization?
4. Is the mark to incorporate letters, words, or just a symbolic design?
5. If the mark is to identify a product, could it possibly become outdated?
6. What is the estimated range of uses (signs, stationery, posters, highway signs, etc.)?
7. What are the positive qualities of the product, service, or organization that are the most important for the design of the trademark?

Another important consideration for the design of a good trademark is its ability to be reduced or enlarged and still be recognized. Often it becomes necessary to reduce a trademark to the size of a postage stamp or enlarge a design to be placed on a highway sign or side of a building. A designer must pay particular attention to the trademark's design to be sure it does not lose its message or become confusing when it is reduced or enlarged.

Once a trademark is developed, the secret to success is to get it out for public inspection. The trademark needs to be viewed by as many people as possible over and over again. The main purpose of a trademark is to identify an organization, product, or service. Hopefully, a trademark is designed in such a way that people can immediately visualize the design and associate it with the correct organization, product, or service, thus improving business.

Because of the power that is associated with trademarks, it has become necessary to regulate them. In order to protect a successful trademark from being stolen or closely copied by another organization, it may be registered with the Untied States Patent Office. Before a trademark can be registered, it must go through a series of examinations by the Patent Office. These make sure the trademark is indeed original and does not infringe on an existing registered trademark. If the trademark passes all the examinations, the Patent Office will then register that design. A U.S. Patent Office registration gives a trademark a legal right to exist and protects the design from being stolen or closely copied for a period of 20 years. If a registered trademark stops being used during this 20 year period, it loses its right to exist.

In the United States, a trademark must be put into use before it can be registered. When two similar trademark registrations are applied for at the same time, the one that was put into use first will be awarded the registration protection. Therefore, it is important to put a trademark into use first and then apply to the U. S. Patent Office for a registration. However, a trademark does not have to be registered to have a legal right to exist. Any trademark that has been around for a period of years has a legal right to exist and can be protected from direct copy. Having a trademark registered simply makes it easier to protect by having a documented date of issue.

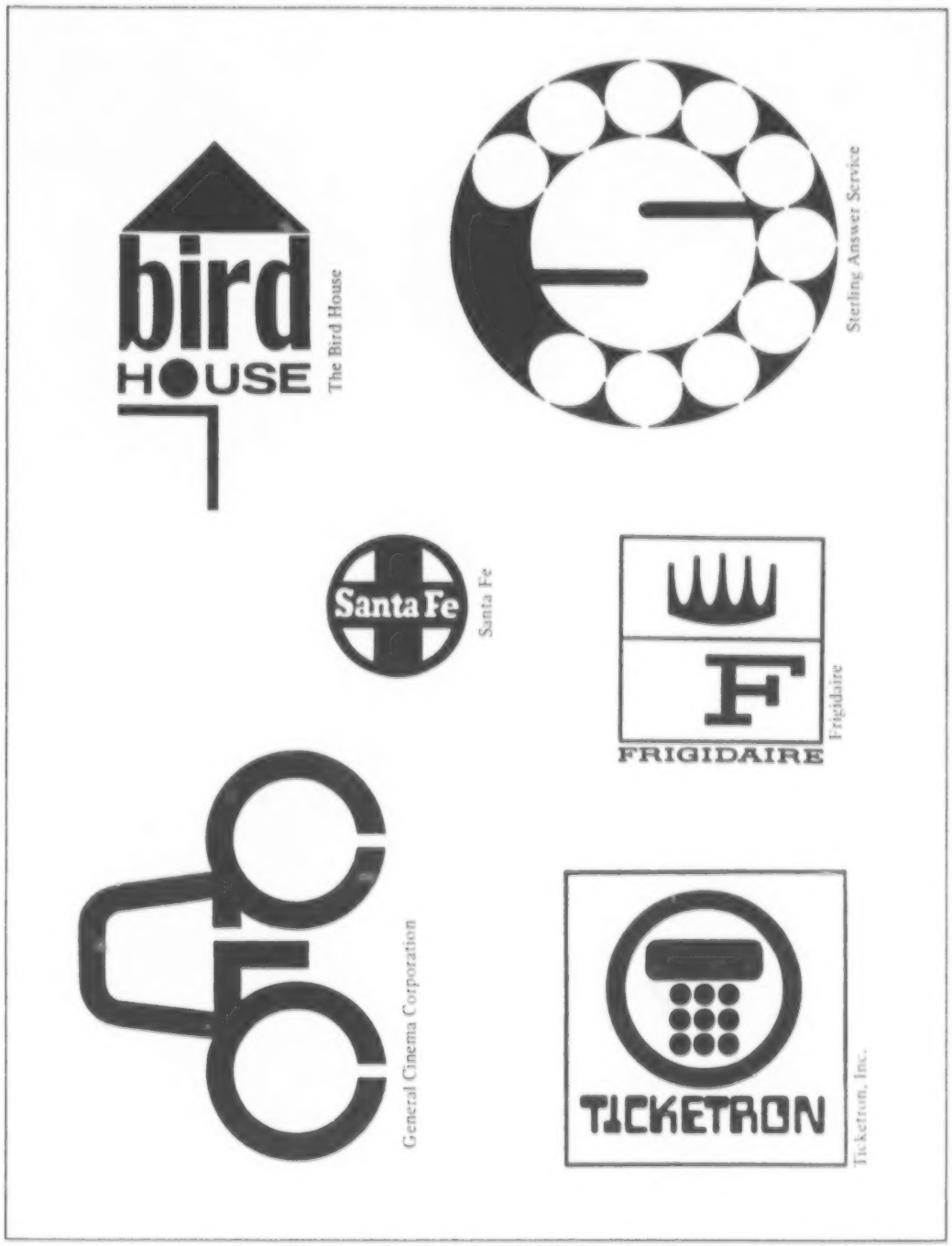
The following pages give many examples of the three different types of trademarks. Study them and then go on to the activities.

Descriptive Trademarks

Symbolic Trademarks

Typographic Trademarks

Combined Trademarks



Activities

You are a member of a team that creates designs for companies. Your agency has been given the task of designing trademarks and company names for four different companies.

Remember that a trademark is a symbol that makes it easy for the public to identify the company. The company name should reflect the products or services offered by the company.

1. Create a company name and design a trademark for:
   - your company
   - recording company (makes tapes and records of popular songs)
   - motorcycle company (sells and services motorcycles)
   - bicycle manufacturer (produces racing bikes)
   - water softener service company (rents water softeners to homeowners)

2. Develop trademark/logo design using thumbnail sketches and rough and comprehensive layouts.

3. The trademark/logo can be descriptive, symbolic, typographic, or combined.

4. All illustrations must be done in india ink or felt-tip marker.

5. Final camera-ready copy (keyline) must be black and white only.

6. All designs must be original.

7. Trademark/logo will be no smaller than 5" x 5".

8. All designs must lend themselves well to reduction (to the size of a postage stamp).

Trademark/Logo Design

(2A) Telecommunications Systems and Processes

Communications

Crystal Radio Receiver, an activity supporting the Electronic Communications concept, is designed for approximately 5 class periods.

Resources Needed

Equipment

Soldering iron
Heat sink
Microscope
Small hand tools (screwdriver, pliers)
Sample completed by teacher for student to observe

Materials

Machine screws, round head, 6-32	4
Hex nuts, 6-32	4
Flat washers, #6	4
Fahnestock clip, 3/4" x 5/16"	1
Crystal earphone	1
IN34 Germanium diode	1
Toilet paper tube (student supplied)	1
26-gauge copper enameled wire	43 feet
60-40 resin core solder	1 piece

Objectives

The student will

understand the different components that make up a radio system;
understand how a radio signal is transmitted and received; and
construct a crystal radio receiver.

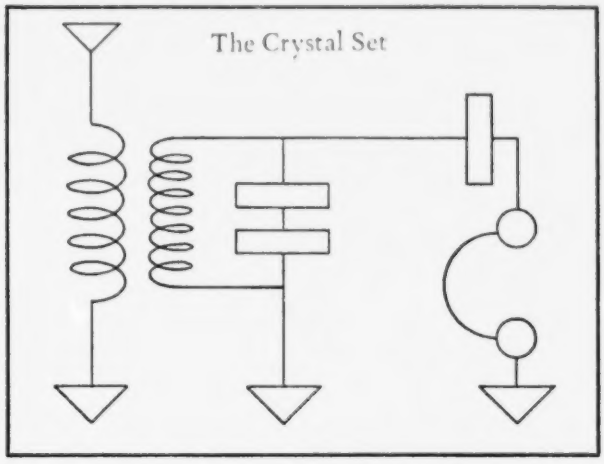
Evaluation Focus

- ☒ Knowledge
- ☐ Awareness
- ☒ Problem Solving
- ☒ Machine/Tool Usage
- ☐ Attitude

Crystal Radio Receiver

Procedure

The Crystal Set



Radio communication makes use of a transmitter and a receiver. The transmitter sends out a message in the form of radio waves. The radio picks up the waves and turns them back into the message first transmitted.

A radio usually does five things:

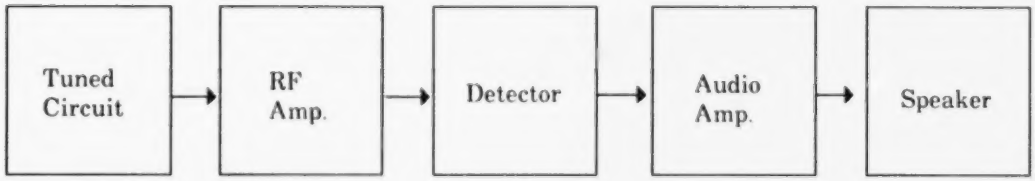
A. Picks up electromagnetic carrier waves sent out by the transmitter. The waves flow across an antenna, making a small amount of electric current flow in the antenna.

B. Selects the desired signal. Many radio waves are in the air. A good receiver will be able to select signals from many stations.

C. Amplifies the RF (radio frequency) signal. Good radios will be able to amplify the RF signal before it reaches the detector.

D. Detects the amplified signal. The detector separates the message from the carrier signal.

E. Amplifies the audio signal. This section makes the signal that comes from the detector loud enough to be heard.



There are usually three things that make the difference between a good and a great receiver:

Sensitivity: great receivers can pick up weak signals and amplify them into a useful output.

Selectivity: great receivers can separate signals so that only one is heard at a time.

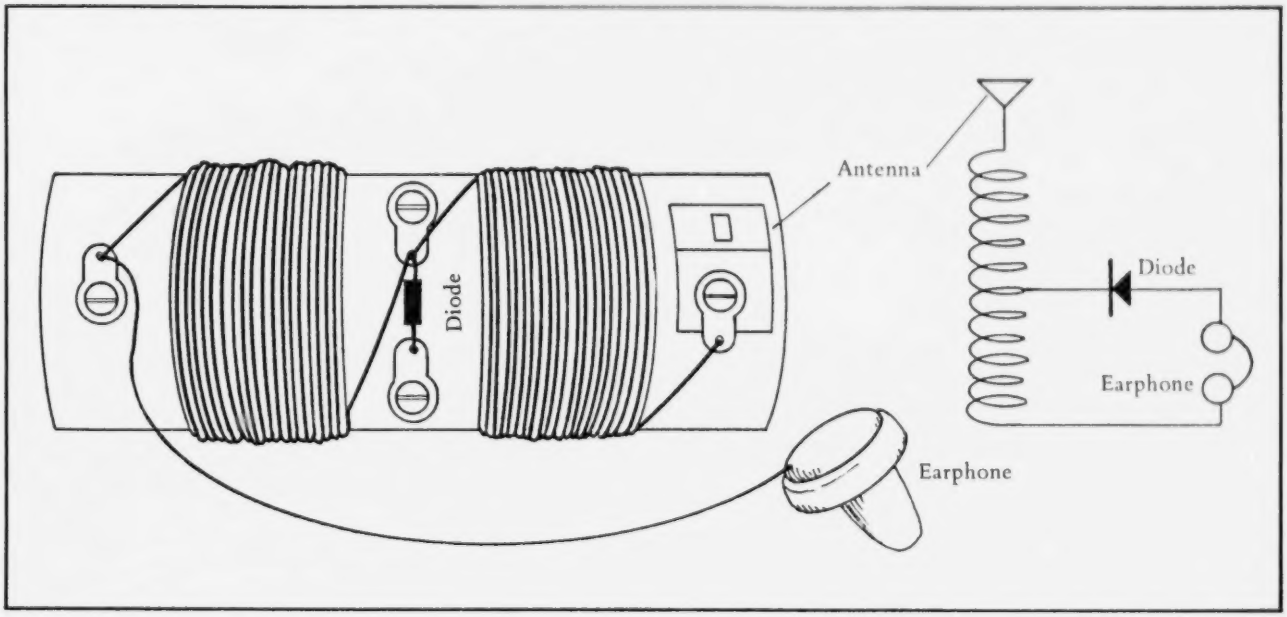
Fidelity: great receivers not only pick up weak signals but can reproduce a signal without distortion.

How a Crystal Set Works

A crystal set is a simple radio receiver. The antenna will pick up a signal from the air. At one instant, current will flow to the ground; at the next instant, it will flow from the ground to the antenna.

You will hear nothing if you connect an antenna and ground directly to the earphone. Antenna currents, because of their high frequency, can't flow through the electromagnets in an earphone. Also, when radio frequencies produce sounds, the sounds are ultrasonic (vibrations that are so fast they can't be heard by human ears).

If you connect a crystal detector to the antenna and ground, and connect an earphone to the detector, you will hear signals. The crystal detector makes the signals audible (able to be heard by your ear). The crystal detector does this because it works like a one-way valve or rectifier. Electron surges in the antenna will flow through the crystal and "Cat's Whisker" (a fine wire on the crystal) to the earphone.



Building a Crystal Set

1. You will need an empty toilet paper tube. Write your name around the center of the tube.

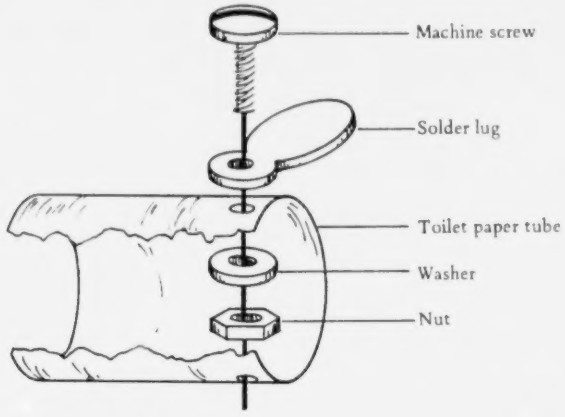
2. Punch two small holes in the center of the toilet paper tube 180 degrees apart.

3. Punch end holes 1 cm (or 3/8") in from each end. (Be careful not to crush the tube.)

4. Obtain the following material:

Machine screws	4
Nuts	4
Washers	4
Solder lugs	4
Fahnestock clip	1

5. Attach all the hardware to the tube. (**Note:** The Fahnestock clip can be attached on either end.)



6. Obtain the following material:

21'6" lengths of 26-gauge wire	2

7. You will be winding two separate coils. Begin winding one coil by cleaning the enamel from one end of the length of wire with a knife or small piece of scrap abrasive paper. Hook and clean end of wire around the solder line to which the Fahnestock clip is connected. (Do not solder the connection yet.)

8. Wind 50 turns of wire around the tube. Cut off the extra wire, but leave enough to connect to a center solder lug. Connect this to a center solder lug. (Do not solder yet.)

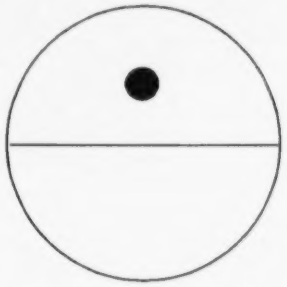
9. Clean the enamel off one end of the remaining length of wire. Fasten the clean end to the *same* center solder lug used to finish the lug in Step 8.

10. Wind 50 turns of wire for the second coil in the same direction as the windings in the first coil. Leave enough wire to fasten the end to the outside solder lug. Clean the enamel off the wire end before fastening.

11. Obtain the following material:

Crystal earphone	1
Type IN34 Germanium diode	1
Piece of 60-40 resin core solder	1
Microscope	1

12. Plug in the microscope light. Place the diode under the microscope so you can see inside the glass part of the diode. Identify and label the Cat's Whisker (a tiny piece of metal rod) and the Germanium crystal (a tiny piece of metallic material).



13. Connect the diode between the two center solder lugs. (Do not solder yet.)

14. Connect one lead from the earphone to the end solder lug that does not have the Fahnestock clip attached.

15. Connect the remaining earphone lead to the center solder lug at the end of the diode that has no other wires connected to the solder lug.

16. At this point, your radio should work when connected to an antenna. If it doesn't, try reversing the diode to see if the reception improves. Check that both coils are wound in the same direction. Ask your instructor for help if necessary.

17. Obtain a soldering iron and heat sink. Plug in the soldering iron.

▶ Caution

The soldering iron should be operated only with your instructor's permission and/or presence.

18. When soldering diodes, a heat sink *must* be used. Fasten the heat sink to the diode between the diode and the solder lug you are going to solder. (You must move the heat sink to solder the other side of the diode.)

19. When the iron is hot, clean the tip with a damp paper towel. Touch the iron to the lug and wires. Heat the junction. Touch the solder to the wires and lug—not to the soldering iron. When the junction is hot, the solder will melt. Don't use too much solder.

20. Solder all four solder lug connections.

21. Obtain shellac. Hold the radio carefully by the earphone wire, and dip the coil in shellac. (Do not dip the earphone.) Drain off extra shellac, and hang the coil overnight to dry. (Make sure the drips fall on scrap wood or paper.)

Using the Crystal Set

The crystal set will operate forever without a power supply. However, you do need a good antenna. The simplest outdoor antenna for receiving signals is a single horizontal wire with the lead-in wire to the set connected on one end. An insulated wire 50 to 100 feet long placed as high and clear of surrounding objects as possible works best. Both ends of the antenna should have insulators and rigid support. Tree branches are not good because they sway in the wind. If you use a tree trunk, have slack in the wire so it can move without pulling the wire. Keep the antenna wire far away from chimneys, metal roofs, gutters, drain pipes, and telephone and, especially, power lines.

The antenna and lead-in should be one continuous piece of wire. Use stranded copper wire, with only the lead-in extending beyond the insulator. A lightening arrestor and ground wire should also be used to avoid a direct hit by lightening.

In some places, you can get results with just a wire attached to the antenna clip. Crystal radios can also be connected to a TV antenna. If your house has an attic, try running a wire across the attic. In tall apartment buildings, a wire with a weight strung down from a window makes a fairly good antenna. Metal bed frames or large coils of wire several feet across wound around a bookcase may work.

Conclusion

When you have finished this activity, please answer the questions on the Student Response Sheet.

Crystal Radio Receiver

Name _____

Class/Period _____

1. If your radio can pick up weak signals from far away, it has good _____.

2. A radio producing garbled or hard-to-understand sound has poor _____.

3. When a radio can separate a signal from many other signals near the same frequency, it has good _____.

4. The abbreviation RF means _____.

5. Radio waves are sent into the area through an antenna by a _____.

6. When radio waves strike the antenna of your radio, they cause _____ to flow in the antenna.

Crystal Radio Receiver

1. Sensitivity
2. Fidelity
3. Selectivity
4. Radio frequency
5. Transmitter
6. Current

(2A) Telecommunications Systems and Processes

Communications

Satellite Communication, an activity supporting the Electronic Communications concept, is designed for approximately 5 class periods.

Resources Needed

Equipment

Videotape machine

Materials

Several videotapes on satellites are available from
Director, Educational Affairs
National Aeronautics and Space Administration
Community Service and Education Branch (LFG-9)
Washington, DC 20546

Objectives

The student will

know why television reception is better with a satellite dish than with a conventional antenna;
understand correct positioning of the dish for best reception;
learn several advantages of satellite transmission; and
develop a basic understanding of how satellite communication has affected our lives.

Evaluation Focus

☒ Knowledge	☐ Problem Solving	☐ Attitude
☒ Awareness	☐ Machine/Tool Usage	

Satellite Communication

Procedure

Communication plays a vital role in any culture. By freely sharing their thoughts and feelings, individuals in a society work together to understand the past and build for the future.

People in high-technology societies often use sophisticated technical systems and devices to help them communicate. In early times, communication among humans was primarily a personal exchange of languages or gestures, usually on a one-to-one basis or in small groups. The development of the printing press, radio, and television changed that.

After the radio was developed, for example, broadcasts could be made to thousands of people at one time. Today, a single television program relayed from a satellite can be seen and heard by millions of people around the globe. Communication of this magnitude influences how people think and act—it is a social phenomenon. As members of society, each of us is affected by communication systems personally and as a member of groups.

This activity will provide an introduction to satellite communication and give you a better insight into how satellites work and how they have affected your life. The sky's the limit in home satellite dish installations with 40,000 new sales each month. One third of home satellite dish buyers make that purchase even though cable TV is available in their area. Sales have increased from 4,000 in 1980 to over 400,000 in 1984, with projections for a total of 4.17 million systems sold by 1990.

Activity Schedule

Day One: Read "Satellite Communications" and answer the questions on the Student Response Sheet.

Days Two, Three, and Four: View videotapes on satellites and take notes. Use your notes to complete a paper about some aspect of satellites. The paper will be a minimum of one page with correct grammar and spelling.

Day Five: Finish paper and check spelling and grammar. Turn in answers from "Satellite Communications" and your satellite report.

Satellite Communications

Picture this scene: Friends drop in and you ask the group, "Would you like to see a program live from Moscow?" You fiddle with the controls on the TV set, a small monitor hums as it automatically adjusts reception, and everybody settles back to watch the Bolshoi. Thanks to a new antenna, the screen brightens with brilliant ballet, unedited and uninterrupted. Too good to be true? Not long ago it would have sounded like pie in the sky, but today the technology is available to accomplish this.

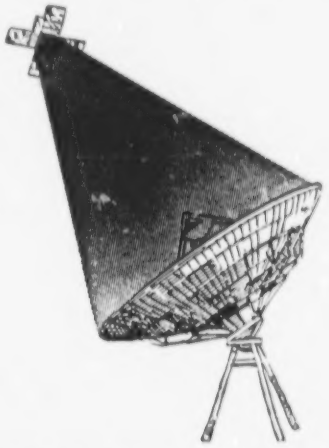
After studying this unit, you will be expected to: 1) explain why you can get better TV reception with a dish than a conventional antenna, 2) define key words used in this article, 3) explain positioning of a dish for best reception, and 4) list three advantages of satellite transmission.

The basic problem of television is not its production, but its delivery. Land broadcast TV has a lot of disadvantages. It works best when the TV antenna and the station transmitter can "see" each other, without objects between them. Unfortunately, there are various objects around to cause problems, including hills, mountains, buildings, bridges, and the curvature of the earth.

One way to avoid these problems is to put the transmitters on high hills and put antennas high on houses. A more practical way of getting a TV transmitter high enough, however, is by putting it on a satellite. This has a lot of advantages. For one thing, the curvature of the earth doesn't affect the signal. Also large buildings, hills, and other objects cannot block the signal. Another factor is that the signals are relatively immune to atmospheric conditions.

For satellite TV to be practical, some way must be found to keep the satellite at the same position relative to the ground at all times. This is done by placing the satellite at the distance from the earth where its orbital speed is zero in relation to the rotational speed of the earth. The distance for such an orbit is 22,300 miles above the equator. Satellites in such an orbit are geosynchronous (or geostationary). A geosynchronous orbit is a parking place for satellites and, like parking places anywhere, is limited in supply. Currently, there are 16 United States and Canadian satellites in orbit.

When signals are transmitted to a satellite, the process is called the "uplink." When they are retransmitted down, it is called the "downlink." It is the downlink signal that the satellite is trying to receive.



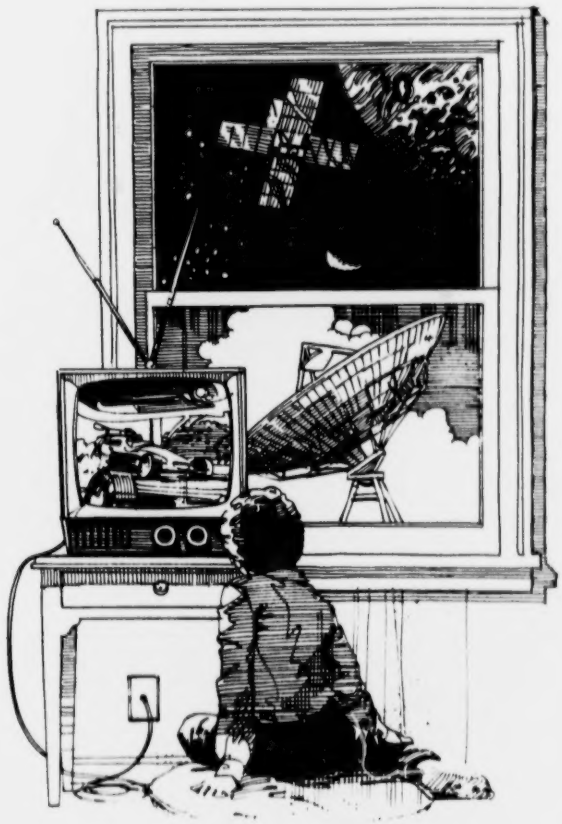
The satellite is not a passive relay station. It does not simply reflect television signals, but receives them, processes them, and retransmits them. The power for operating the necessary electronic gear is obtained from batteries. These batteries are charged using solar cells adjusted to keep pointing at the sun.

A dish is a parabolic shaped reflector that directs satellite signals to the feedhorn mechanism. This dish has the double function of gathering as much signal energy as possible and focusing that energy on the entrance to the feedhorn.

Dishes are made of stainless steel or aluminum, so they must be coated with rust preventatives. The coating that covers the metallic surface of the dish is a type that is heat absorptive rather than reflective. The object is to direct as little heat as possible toward the feedhorn.

Because the parabolic dish is made to face a selected satellite, some provision must be made for turning the dish if reception from more than one satellite is wanted. To be able to "see" a selected satellite, the dish must be able to move horizontally and vertically. North American sateilites occupy a small part of the geosynchronous orbit—from 72 degrees to 143 degrees west longitude.

Satellite communication is expected to grow until all the parking places are full. It has been predicted that in the next 20 years, a wrist radio will be devised that can provide personal communications by satellite link. It will be exciting to see if this happens. For further study of this form of communication, look in the library card catalog under "communications," "satellites," and "television broadcasting."



Satellite Communication

Name _____

Class/Period _____

1. How many satellites are presently above North America?

2. What term is used to describe sending a signal to a satellite?

3. What part of the dish absorbs the signal?

4. How far away from the equator is the geosynchronous orbit?

5. Define these key words:

   A. dish

   B. uplink

   C. downlink

   D. geosynchronous

   E. satellite

(2A) Telecommunications Systems and Processes

Communications

Video Presentation, an activity supporting the Electronic Communications concept, is designed for approximately 5 class periods.

Resources Needed

Equipment

Video camera
Editing deck
Graphics tablet and wire leads (optional)
Computer system (optional)

Materials

Film
Computer graphics software package (optional)
Poster board (optional)

Objectives

The student will

write a script suitable for production;
gain an understanding of various filming techniques and their application;
be able to work with video equipment, involving audio dubbing, editing, and inserting a title;
understand the applications of computer graphics (optional);
be able to insert computer graphics in a video presentation (optional); and
develop skills in the evaluation of video productions.

Instructor's Option

This activity is best done in small groups (three to five students). It requires that you provide instruction on the use of the video equipment, filming techniques, and suggestions for scripts prior to making the assignments. Encourage creativity and originality as students work. You may use the activity without the graphics tablet component if the equipment is not available; have students "generate" the graphics on poster board rather than video.

Evaluation Focus

- ☒ Knowledge
- ☒ Awareness
- ☐ Problem Solving
- ☒ Machine/Tool Usage
- ☒ Attitude

Video Presentation

Introduction

Video is gaining increasing importance as a means of communicating in business, industry, and educational settings. With the cost of video equipment declining, we see video technology being used in many applications.

This activity will help develop an understanding of the technology being used, equipment capabilities, and what goes into actual production and planning of a video presentation.

Glossary

Pan—Move the camera's field of focus in a "scanning" manner across the area being videotaped.

Fade in—Bring the image into focus.

Fade out—Reduce the focus (often done when changing from one scene to another).

Zoom—Close in on the subject, eliminating a portion of the previously recorded field.

Procedure

In this activity you are asked to develop a script for a video presentation (usually lasting 30 or 60 seconds). Your tape can be any kind of program you want (a story, a commercial, a public service message). You will also generate the program title, ending credits, and other graphics on a graphics tablet and save them on a separate disk. (Alternately, these can be prepared on poster board and then be incorporated into the script.) In filming your presentation, use the filming techniques of pan, zoom, fade in, and fade out, and be sure to leave room on the ends of your tape for the title, credits, and so forth.

Day One

Review directions and instructions for using the camera, editing deck, and graphics tablet.

Days Two and Three

The group meets and develops the script, credits, and title and prepares for filming. Camera directions are decided on, props are secured, and cue cards are printed. Practice your presentation without a camera.

Day Four

1. Refine the previous day's activities.

▶ Caution

The electronic equipment should be operated only with your instructor's permission and/or presence.

2. Film the complete program using a practice tape. (Incorporate the filming techniques of pan, zoom, fade in, and fade out.)

3. Use the editing deck as needed.

Day Five

1. Make any necessary adjustments, and then film your final tape.

2. Return materials and secure equipment.

3. Clean the area.

(2A) Telecommunications Systems and Processes

Communications

Video Recording, an activity supporting the Electronic Communications concept, is designed for approximately 5 class periods.

Resources Needed

Equipment

Video cassette recorder
Screen/TV
Camera
Microphone

Materials

Videotapes

Objectives

The student will

become familiar with typical products used by communications industries to create, manipulate, store, send or receive, and market information;
develop an awareness of careers in television communications;
explore skills required in using television production equipment and processes; and
write and film a short video program.

Evaluation Focus

☒ Knowledge	☐ Problem Solving	☒ Attitude
☒ Awareness	☒ Machine/Tool Usage	

Video Recording

Procedure

When producing a television program, two major factors must be decided. These relate to the content and the format. Content is *what the program is about*, that is, the subject of the program. Format is the *structure of the program* or the arrangement in which the content idea is presented.

This activity will help you identify the various jobs involved in the production of a program. Your task will be to develop a news program similar to those seen on commercial television, only much shorter. Each person will be required to use the camera to tape someone else and to be taped giving a presentation. Minimum areas that must be covered are news, weather, and sports. A commercial or "on-the-scene" report may be used in between these so the tape can be stopped or to allow each person in your group the chance to be taped.

Day One

Review directions and instructions for using the camera and video cassette recorder (VCR).

Day Two

1. The group meets to decide who will do the news, weather, sports, or other necessary features (commercial, on-the-scene report, editorial, etc).

2. Schedule who goes first, second, third, etc.

3. Each person will write out a word-for-word script.

Day Three

With the scripts written out, the group gets together and practices *without* a camera to

get the program to flow smoothly;
develop camera directions;
print cue cards, if necessary; and
design props, if necessary (weather maps, background panel, etc.).

Day Four

1. Refine the previous day's activities.

> **▶ Caution**
>
> The VCR and camera should be operated only with your instructor's permission and/or presence.

2. Film the complete program, using a practice tape.

Day Five

1. Make any necessary adjustments, and then film your final tape.
2. Put materials back.
3. Clean the area.

(2C) Computer Systems and Processes

Communications

Armoroid (Robotic Arm), an activity supporting the Electronic Communications concept, is designed for approximately 3 to 5 class periods.

Resources Needed

Equipment

Apple computer system

Materials

Armoroid robotic arm and software, available from
L.A.B. Corporation
8101 Milwaukee Avenue
Wauwatosa, WI 53213
Blank computer disks
Preprinted 360° marked layout sheet
Blocks or other lightweight objects to pick up

Objectives

The student will

understand and use the Armoroid software;
connect Armoroid to power supply and computer correctly;
load Armoroid to power supply and computer;
practice basic keyboarding;
practice basic problem solving; and
practice program storage and retrieval.

Evaluation Focus

☒ Knowledge ☒ Problem Solving ☐ Attitude
☐ Awareness ☐ Machine/Tool Usage

Armoroid (Robotic Arm)

Procedure

1. Write a program to cause the Armoroid robotic arm to pick up objects and place them at specified points on the preprinted 360° marked layout sheet. Include commands to demonstrate

   360° wrist rotation at _____ degrees;

   base rotation to _____ degrees;

   2" minimum forearm raise at _____ degrees;

   4" minimum shoulder raise at _____ degrees; and

   open and close hand at _____ degrees.

   (Your instructor will select the location for each component. Your program will not be the same as your neighbor's.)

> **Caution**
>
> The pulleys and drives of the Armoroid robotic arm are not designed for heavy loads. Excessive loading could cause parts to fail and/or become damaged, requiring replacement.
>
> The computer should only be operated with the instructor's permission and/or presence.

2. Set Armoroid robotic arm. Check that

   the platform is locked to the table;

   the power supply is screwed into the two-pronged outlet at the back of the Armoroid; and

   the computer cable is attached correctly to the blue ten-pin connector. (**Note:** The connector fits only one way, with the spotted side facing up. If you force it, you could damage the machine.)

3. Find the Armoroid disk.

   Insert into drive and boot the computer.

   Use control, open Apple, and reset to do this.

4. Set Armoroid's starting point. To do this, be certain Armoroid is resting with its fingers centered on the wooden dowel. If not,

   type I, and drive Armoroid to its correct starting position.

   To drive Armoroid, use the commands listed below. (**Note:** To stop movement of Armoroid, press "space bar".)

   -1/Q Open/close hand

   -2/W Rotate hand—left/right

   -3/E Raise/lower wrist

   -4/R Raise/lower forearm

   -5/T Raise/lower shoulder

   -6/Y Rotate base—left/right

5. When Armoroid is on the starting point,

   if you did not have to adjust position, press "T";

   if you had to adjust position, press "X" and then press "T".

6. To program Armoroid (as when correcting the starting position),

   press "I".

   Use the commands from Step 4 to move the Armoroid.

   Note: In order to "set" or lock a command, you must press "." after each movement in order to "save" it.

7. After completing the program, go back to the main menu by pressing "X".

8. To test your program, press "E" and then "O".

9. To spot a problem area, you can go forward/backward one point by pressing "K"/"L".

10. To save your program, press "X".

    Slot = 6

    Drive = 1

11. To load a program, press "Z".

    Slot = 6

    Drive = 1

12. To leave the Armoroid program, press "Q".

(2C) Computer Systems and Processes

Communications

Binary System, an activity supporting the Electronic Communications concept, is designed for approximately 1 to 2 class periods.

Resources Needed

None

Objectives

The student will

define the term "binary system";
compose a byte of information using eight bits of binary code;
convert a binary number (base two system) into a decimal number (base ten system); and
explain how a computer reads binary numbers.

Evaluation Focus

☒ Knowledge	☒ Problem Solving	☐ Attitude
☐ Awareness	☐ Machine/Tool Usage	

Binary System

Procedure

1. Read the following explanation of the binary system.

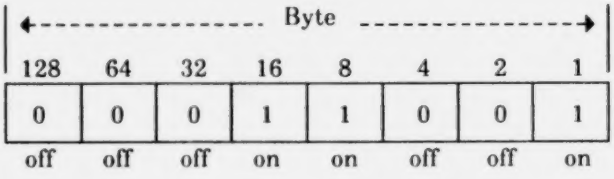
   One of the main things that a computer does is count. Whether it is writing words, using characters, or making calculations, the computer must keep track of data by counting. This counting is done at a very fast speed. With electrical circuits designed for computer functions, large amounts of information can be counted (processed) in a short time.

   Understanding how the computer can count requires learning a different number system. Numbers are counted (1, 2, 3, 4, 5, 6, 7, 8, 9) using the base ten, or *decimal system*. Because a computer can only deal with very simple terms, it cannot use this number system. The computer can only sense if something is magnetized or not magnetized, punched or not punched, lighted or not lighted, on or off.

   The *binary system* was developed to tell the computer if a switch is on or off. It does this by controlling voltage. A computer counts in the binary system, because it only reads 0 and 1.

   If the computer reads 0, the bit of information is read as "off" or "0" volts. If the binary number 1 is read, the information is read as "on" or "5" volts. Because computers use this binary code, it is necessary to have two levels of voltage; 0 volts represented by the binary 0, and 5 volts represented by the binary 1.

   When the computer keeps track of data (counts), it is simply turning switches on and off; 1's and 0's. A computer normally groups these bits of 1's or 0's into sets of eight. The group of eight bits is called a "byte." A byte of binary information is based on numbers grouped in the powers of two. For example, the decimal number 25 is expressed as:



   16 plus 8 plus 1 equals binary number 25

The largest power of two in 25 is 16, which is on. Subtracting 16 from 25 leaves 9 still to be counted. There is no 9, so the 8 and 1 bits are on also in order to equal 9; all other bits are off. The computer's binary system reads the number 25 as 00011001.

As another example, if the base ten number is 76, what is the correct binary byte? The largest power of two in 76 is 64. The remaining value (12) is the combination of 8 and 4. Since all other binary bits are off, the 76 value would appear as 01001100.

128	64	32	16	8	4	2	1
0	1	0	0	1	1	0	0

When adding bytes, the computer again calculates in the base two (binary) system. To do this, it has to carry. It adds 1 to an existing 1, but shows a 0 in that place with a 1 at the next higher position. Look at the following example.

	Regular Method	Binary Method
The computer is to add 37 and 20.	37 +20 57	00100101 +00010100 00111001

Some additional examples are:

11 + 7 18	00001011 +00000111 00010010	and	38 +11 49	00100110 +00001011 00110001

The binary system is also used to write words. High level languages use words that the programmer understands. The computer changes these words into the binary machine language it can use. Here is an example of a binary letter code.

A	0100	0001	K	0100	1011	U	0101	0101
B	0100	0010	L	0100	0011	V	0101	0110
C	0100	0011	M	0100	0010	W	0101	0111
D	0100	0100	N	0100	0001	X	0101	1000
E	0100	0101	O	0100	1111	Y	0101	1001
F	0100	0110	P	0100	0000	Z	0101	1010
G	0100	0111	Q	0101	0001			
H	0100	1000	R	0101	0010			
I	0100	1001	S	0101	0011			
J	0100	1010	T	0101	0100			

Note: Different computers may have different codes.

If a programmer were to write the word "HELLO," this is what this binary code would look like.

HELLO:	H	E	L	L	O
	01001000	01000101	01000011	01000011	01001111

2. Review the following terms.

   Bits—an abbreviation of *bi*nary dig*it*. The code symbol is 0 or 1.

   Byte—a set of bits considered as a unit. A normal byte is 8 bits long.

   Binary system—a method of noting bits of information using 1 and 0. A base two numbering system.

   High level language—a programmer's language used to give instructions to a computer.

3. Answer the questions on the Student Response Sheet.

Binary System

Name _____

Class/Period _____

1. Define the term binary system and tell what voltages are used with it.

2. Convert 83 to a binary byte.

3. Convert 121 to a binary byte.

4. Change 01101101 to a decimal number.

5. Change 11010001 to a decimal number.

Add the following numbers, and give the answers in both binary and decimal forms.

6. 00001011
+ 00000101

_____ Binary
_____ Decimal

7. 00010101
+ 00001001

_____ Binary
_____ Decimal

8. 10010110
+ 00110101

_____ Binary
_____ Decimal

Read this code.

9. _____
01000111

10. _____
01001111

11. _____
01001111

12. _____
01000100

13. _____
01001010

14. _____
01001111

15. _____
01000010

Binary System

1. The binary system is a base two numbering system that notes bits of information using 0 or 1. Binary 0 represents 0 volts; binary 1 represents 5 volts.

2. 01010011

3. 01111001

4. 109

5. 209

6. 00010000 Binary
   16 Decimal

7. 00011110 Binary
   30 Decimal

8. 11001011 Binary
   203 Decimal

9. G

10. O

11. O

12. D

13. J

14. O

15. B

(2C) Computer Systems and Processes

Communications

Character Generation, an activity supporting the Electronic Communications concept, is designed for approximately 5 class periods.

Resources Needed

Equipment

Apple IIe computer system
Epson RX80 printer

Materials

The Bank Street Writer software, available from Apple computer dealers (activity can be adapted for use with other word processing software)
Blank computer disks
Newspapers

Objectives

The student will

recognize typical products produced by communications industries to create, manipulate, store, send, receive, and market information;
understand and use the classified advertising section of a newspaper;
identify the important features of an advertisement (ad);
understand and use *The Bank Street Writer* software; and
prepare, cost, and print an ad.

Evaluation Focus

☒ Knowledge
☐ Awareness
☐ Problem Solving
☒ Machine/Tool Usage
☐ Attitude

Character Generation

Procedure

In this activity, you will learn the important components of a classified ad. You will prepare a mock-up ad and, using *The Bank Street Writer* software, the Apple IIe computer, and the Epson RX80 printer, you will generate a copy of the ad that you have created.

In the following steps, whenever you are asked to locate ads, keep track of the name of the newspaper, date of issue, page that ad is to be found on, and find who, what, where, when, and how much concerning the item for sale.

1. Select three ads selling bicycles or other items from the classified section of a newspaper. Cut out the ads and glue or tape them under Item 1 of the Student Response Sheet that follows these directions.

2. Select one of the ads and answer the questions listed under Item 2 of the Student Response Sheet. If information answering each question is not listed, indicate that.

3. Assuming current ad costs are $.20 per line per day, how much did the writer of the ad that you selected pay for it and for the five days that the ad was run? Answer at Item 3.

4. Now it is your turn to sell your bicycle. Write your own ad using the key questions found in ad development: who, what, where, when, and how much? This is a mock-up ad. Lay out this mock-up next to Item 4 on your response sheet. Limit yourself to four to six words per line.

5. Using your mock-up ad, calculate the cost of your ad using the rate schedule of $.20 per line per day for your ad. Answer at Item 5.

6. Select three ads selling automobiles from the classified section of the newspaper, and place them under Item 6.

7. Next you are going to prepare an ad to sell your family's car. You will need information regarding that auto. This can be secured by asking your family or looking up the information in the owner's manual that came with the auto. Find and list the information on your Student Response Sheet at Item 7.

8. Again, using the ad development questions, lay out an ad to sell the family automobile. Once you have formulated your ad, lay out the final draft on the lines next to Item 8 on your Student Response Sheet.

9. Calculate the cost of your ad using the rate schedule of $.20 per line per day. Answer at Item 9.

▶ Caution

The computer should be operated only with your instructor's permission and/or presence.

10. You will need to be familiar with *The Bank Street Writer* software program before you can answer the following questions. If you are *not* familiar with *The Bank Street Writer* program, start with the step-by-step Tutorial program located on the reverse side of the program disk. To load the Tutorial, slide the disk into the drive with the label facing down. Then turn on your computer and monitor. In a few seconds, instructions for using the Tutorial will appear on the screen. Work your way through the program. When you are familiar with *The Bank Street Writer* program, answer the following questions on your Student Response Sheet. At Item 10, write the term that matches the correct definition.

A. A function that removes all or some of the text on your screen so that you can begin a new document	1. Save
B. A function that removes a document from your disk	2. Return
C. The process of preparing a disk to store data from your computer	3. Retrieve
D. A function that allows you to make a printed copy of your document	4. Initialize
E. A program that is selected if you want to exit from *The Bank Street Writer* and load another program	5. Delete file
F. A function that allows you to change the name of a document file on a disk	6. Rename file
G. A function that loads a document file from a data disk into the computer	7. Print
H. A key that moves the cursor to the start of the next line (In the edit function, this key activates the highlighted function.)	8. Clear
I. A function that transfers a copy of a document or part of a document from the computer to the data disk, where it is stored for subsequent use	9. Quit program
J. A function that reinstates a portion of text that you have erased	10. Unerase

11. Now you are ready to enter your ad to sell the family's car into the computer.

    A. Insert *The Bank Street Writer* disk into the disk drive. If you have more than one disk drive, insert the program into drive number one.

    B. Close the disk-drive door.

C. Turn on your monitor or TV.

D. Turn on the computer. If your computer is already on, press and release the RESET key while you are holding down the CONTROL key and either Apple key. The disk drive will make some noises. In a few seconds, *The Bank Street Writer* will appear on your screen, and you will be ready to type in text. **Note:** Do not remove the disk while the disk drive's red light is on.

E. Before turning your program off, enter, save, and type your first initial and your last name on an initialized data disk.

F. Using the Apple IIe, *The Bank Street Writer* software package, and the Epson RX80 printer, print a copy of your family's automobile ad. Attach this in the appropriate space on the response sheet at Item 11.

Character Generation

Name _____

Class/Period _____

1. Glue or tape the three ads from a newspaper regarding the sale of a bicycle (or other item).

   Ad One Ad Two Ad Three

   Name of newspaper, date of issue, page(s):

2. Ad selected (circle): one, two, three.

   A. Who is the seller?

   B. What is the item for sale?

   C. Where can more information be obtained?

   D. When can the information be obtained?

   E. How much is the cost of the item?

3. Cost per ad?

   Cost per five days?

4. Place your own mock-up ad below. (You may not need all of the lines shown. However, keep in mind that you should have four to six words per line.)

Line one

Line two

Line three

Line four

Line five

Line six

5. Cost of your ad?

Cost of your ad for five days?

6. Glue or tape three ads from a newspaper regarding the sale of automobiles.

Ad One Ad Two Ad Three

Name of newspaper, date of issue, page(s):

7. List the following information regarding your family car in this order:

   A. Make of auto:

   B. Year:

   C. Model:

   D. Color:

   E. Horsepower (number of cylinders):

   F. Mileage:

   G. Transmission type:

   H. Other options:

   I. Price:

8. Place your mock-up ad below. (You may not need all of the lines. However, keep in mind you should have four to six words per line.)

   Line one

   Line two

   Line three

   Line four

   Line five

   Line six

9. Cost per ad?

   Cost per five days?

10. Write in the term that matches the correct definition listed in the package on *The Bank Street Writer*.

A.	_____	F.	_____
B.	_____	G.	_____
C.	_____	H.	_____
D.	_____	I.	_____
E.	_____	J.	_____

11. Glue or tape the printed copy of your automobile ad.

3. Cost per ad? $.20 x number of lines

   Cost per five days? $.20 x number of lines x five days

5. Cost of your ad? $.20 x number of lines

   Cost of your ad for five days? $.20 x number of lines x five days

9. Cost per ad? $.20 x number of lines

   Cost per five days? $.20 x number of lines x five days

10. Write in the term that matches the correct definition listed in the package of *The Bank Street Writer*.

A. clear	F. rename file
B. delete file	G. retrieve
C. initialize	H. return
D. print	I. save
E. quit program	J. unerase

(2C) Computer Systems and Processes

Communications

Computer Graphics, an activity supporting the Electronic Communications concept, is designed for approximately 2 or 3 class periods.

Resources Needed

Equipment

Apple computer system
Color screen

Materials

Blank disks
Graph paper
Colored pencils

Objectives

The student will

develop and/or use basic computer skills;
program the computer to produce and print initials; and
make a graphic display of the initials.

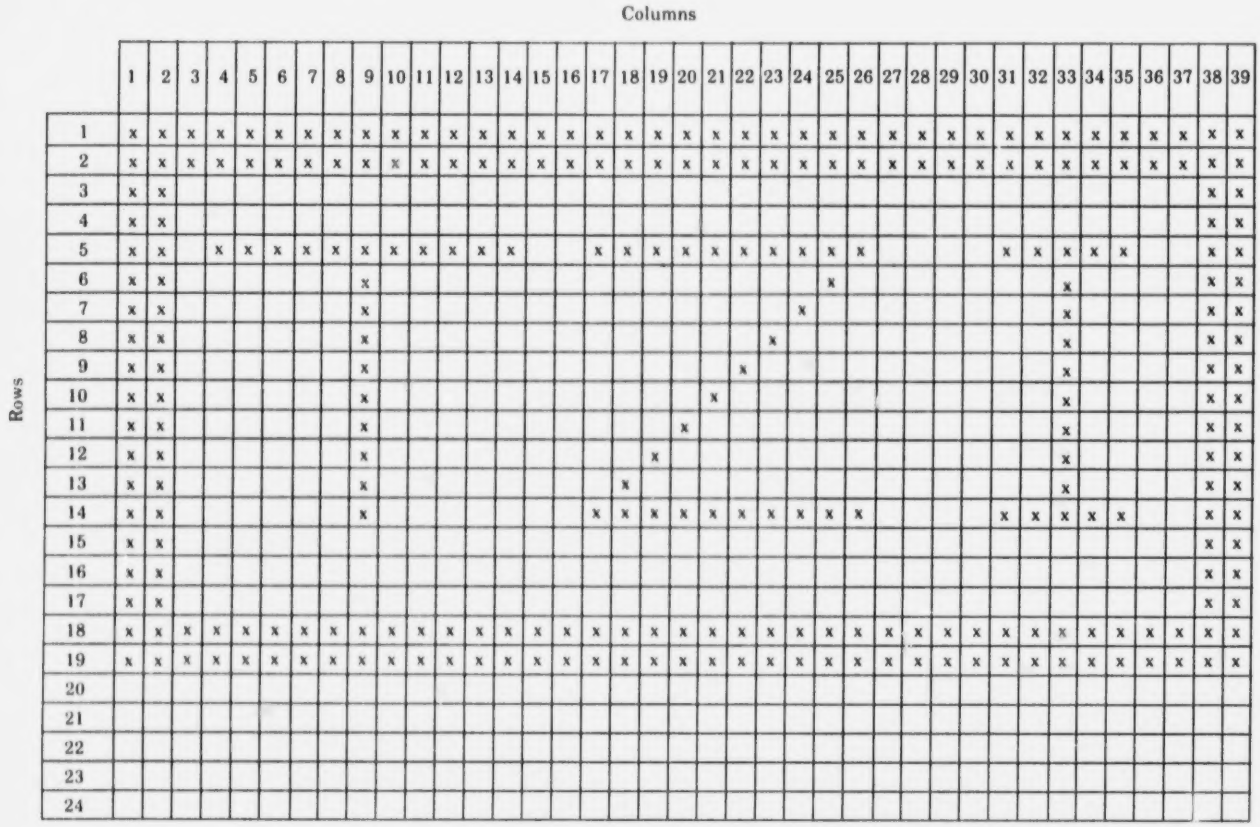
Evaluation Focus

☒ Knowledge	☐ Problem Solving	☐ Attitude
☐ Awareness	☒ Machine/Tool Usage	

Computer Graphics

Procedure

1. Number a sheet of graph paper according to the sample given. Going across the top, number each column square 1-39. Going down the side, number each row of squares 1-24. This is your work sheet. Now draw in your initials and underline or frame them, as in the sample.



You are going to program the computer to make a graphic display of your initials as you have drawn them. Understanding how the computer was programmed to produce the sample should provide the information needed to program your initials.

(Before you actually begin, you should give the computer line numbers, such as 10, 20, 30, and so forth. You may start with any number [under 35,000], but skip several numbers between each line in case a new line needs to be inserted later. It works well and is easy to remember if you use the number you get by multiplying the line number on your graph by 10. For example, line 1 becomes 10, 2 becomes 20, and so on. In any event, each command will start with a line number.)

The sample contains the letters TZI. The computer must draw two lines in order to make the T. In order to draw a horizontal line from columns 4 to 14 at row 5, the correct command is:

30 (line number) HLIN 4, 14 at 5

To make a vertical line from row 5 to row 14 in column 9, tell the computer:

40 (line number) VLIN 5, 14 at 9

In order to make the shaft of the Z, however, you must use separately placed periods (or points), since the computer cannot draw a diagonal line. The point at 25, 6, which means column 25, row 6, is typed into the computer as:

50 PLOT 25,6

These are the program lines for the complete example, including instructions for the color screen. Study these and be certain you understand how they produce the sample.

```
10   GR (Gr tells the computer you want to draw lines.)
20   COLOR = 1
30   HLIN 4, 14 AT 5
40   VLIN 5, 14 AT 9
55   COLOR = 4
60   HLIN 17, 26 AT 5
70   PLOT 25, 6
80   PLOT 24, 7
90   PLOT 23, 8
100  PLOT 22, 9
110  PLOT 21, 10
120  PLOT 20, 11
130  PLOT 19, 12
140  PLOT 18, 13
150  HLIN 17, 26 AT 14
160  COLOR = 1
170  HLIN 31, 35 at 5
180  VLIN 5, 14 AT 33
190  HLIN 31, 35 AT 14
210  COLOR = 13
220  HLIN 1, 39 AT 1
230  VLIN 1, 19 AT 39
240  VLIN 1, 19 AT 1
250  HLIN 1, 39 AT 19
```

```
260   COLOR = 1
270   HLIN 2, 38 AT 2
280   HLIN 2, 38 AT 18
290   VLIN 2, 18 AT 2
300   VLIN 2, 18 AT 38
```

2. Analyze your work sheet and prepare the program lines that will tell the computer to execute your design. Have your instructor check your commands.

▶ Caution

The computer should be operated only with your instructor's permission and/or presence.

3. At the computer, proceed through the following instructions:

   A. Carefully boot up the working disk.

   B. Turn on the power bar. **Note:** The red light on the disk drive should go off after five seconds. If it doesn't, shut off the power and get help. Did you put the disk in?

   C. Make sure the type lock is down (lower left key).

   D. Type in "NEW", return—this erases the memory in the computer.

   E. Type in "HOME", return—this clears only the screen.

   F. This computer needs line numbers—10, 20, 30, etc. Start with any number under 35,000, but skip several numbers each time so a forgotten line may be added later. Type "10 GR", return (GR tells the computer you want to draw lines).

   G. Type in "20 COLOR = 1", return. If you have a color TV on this computer, the colors are 1 to 15.

   H. Points and lines:

      1) Type "30 PLOT 20, 5", return—this tells the computer to light a square at column 20, row 5.

      2) Type "40 VLIN 5, 10 at 30", return—this tells the computer to draw a line starting at row 5 going to row 10 in column 30.

      3) Type "50 HLIN 20, 25 at 1", return—this tells the computer to draw a line starting at column 20 going to column 25 at row 30.

   I. To see this example on the screen, type "RUN".

   J. To get back to your program statement, type "TEXT", return—this tells the computer to list the numbered lines in order.

   K. When the example works, and you understand what to do, type "NEW"—then type in the lines of your program.

   L. Save the program by typing "SAVE (YOUR NAME)", return.

   M. To see your final program on the screen, type "RUN".

(2D) Electronic Communications Industry Products

Communications

Mighty Modem, an activity supporting the Electronic Communications concept, is designed for approximately 2 class periods.

Resources Needed

Equipment

Videotape machine
Apple computer system
Modem

Materials

The Electronic Mailbag videotape, available from
EXSYS
2728 23rd Street
Greeley, CO 80631
(303) 330-8021

Optional: Use *The Electronic Mailbag* software package for the Apple II+, IIe, and IIc computers (available from Apple dealers).

Objectives

The student will

understand the uses and correct hookup of computer modems;
be able to differentiate between kinds of modems; and
complete a modem hookup to a computer (optional).

Evaluation Focus

☒ Knowledge
☐ Awareness
☒ Problem Solving
☐ Machine/Tool Usage
☐ Attitude

Mighty Modem

Procedure

Electronic transfers of information at super fast speeds from one location to another are one of the byproducts of our computer age. Modulator/demodulators, usually referred to as "modems," are one type of product designed to handle such transfers. This activity will help you understand their uses, types, and mechanical hookups.

1. First read the cartoon booklet *Mighty Modem*.

2. When you have finished the booklet, view the videotape *The Electronic Mailbag*.

3. With your instructor present, demonstrate the correct modem hookup to the computer.

4. Answer the questions on the Student Response Sheet.

MIGHTY MODEM

In this issue
Mighty Modem convinces Mr. Big
of the value of telephone modems

Place: Littletown, U.S.A.
Scene: Littletown Manufacturing Company
President's Office

Mr. Big: "We have a problem! Our newest account is *demanding* inventory and production data from us every hour. We can't keep taking our computer operators off their terminals to call our other plant in Great Falls and then phone all that information to Big Bopo Inc. This way just takes too much time. Does anyone have any suggestions?

Meanwhile:
At Digitron World Headquarters, mild-mannered computer programmer Harold Sharp senses impending disaster someplace in Computerworld . . . .

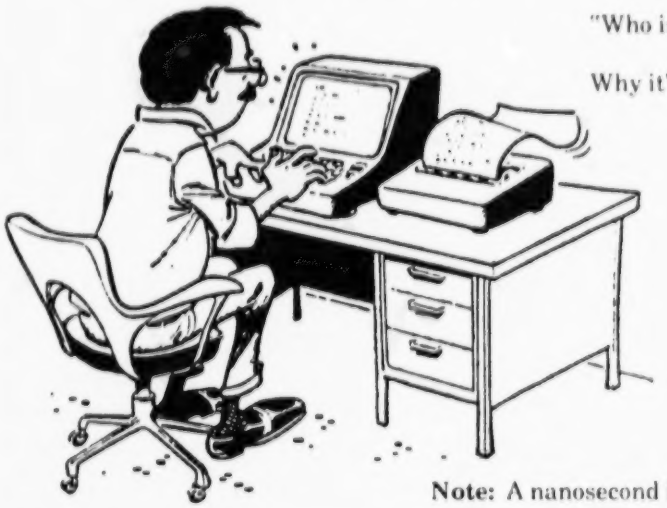
As fast as his fingers will move over the keyboard, Harold programs in his secret code:

007E7E7818181800

In barely a nanosecond, he is transformed into that famous work and data saver who transmits data faster than a speeding bullet.

"Who is this wonder?" you ask.

Why it's. . .



Note: A nanosecond is one billionth of a second.

Back in Littletown: Just a few seconds later, in through Mr. Big's phone line comes *Mighty Modem*.

Mr. B: "What the heck are you?"

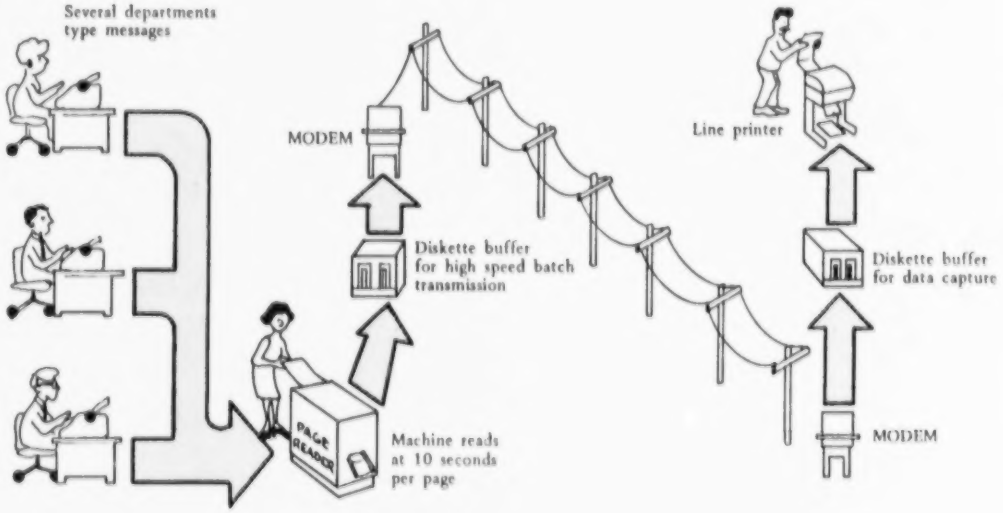
MM: "Well, Mr. B, I'm a *modulator/demodulator* capable of sending and/or receiving signals over telephone lines by specially coded messages. You can call me *Mighty Modem*."

Mr. B: "What are you doing here?"

MM: "I came to help you solve your communications problem. I can change into any modem combination you might need to transmit information and/or data from one place to another with amazing speed and accuracy (if I do say so myself)."

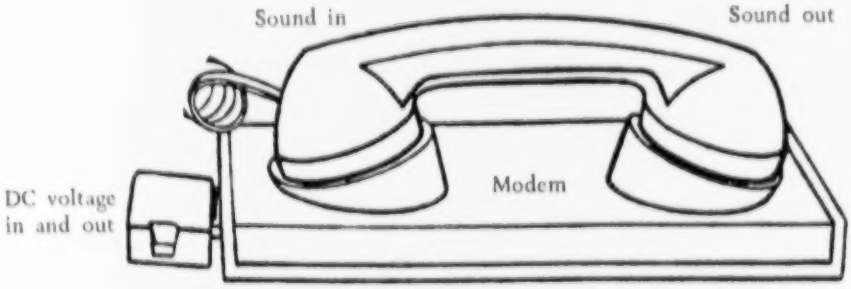
Mr. B: "That doesn't tell me much. Go on, I want to hear more."

MM: "Well, Mr. B, electrical signals from your computers or terminals are converted by me (*modulated*) into audio tones that are fed into my speakers and then on to the telephone lines. Once in the phone lines, the data is transmitted to another modem. The signals are picked up at the other modem by its microphone. From the microphone, the signal is *demodulated*, or converted back into electrical signals that can be recognized by the computer. Often times, this talking back and forth between computers and terminals is called *handshaking*."



Mr. B: "You'll have to do more than just jump out of telephone lines to help me buddy!"

MM: "Just look at what I can do! I can become an *acoustic modem* or a *direct-coupled modem*."



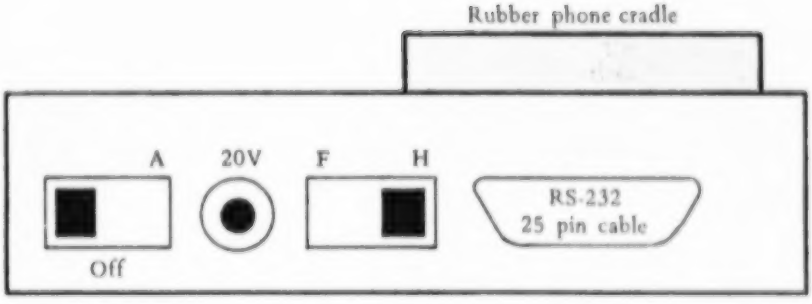
Note: Acoustic Modem: A device in which a telephone handset is plugged into two rubber cups. One side of the modem is connected to a computer, and the other is connected with telephone lines. The modem allows data to connect with the phone with a carrier tone.

Direct-Coupled Modem: This modem is wired directly to the existing phone line. The phone does not have to be manually connected to the modem. This device is capable of answering the phone when it hears the carrier tone.

The acoustic modem above shows the basic parts of most modems. There must be a sound or signal going into the modem, signal going out, and an AC/DC power voltage to power both in and out signals. A direct-coupled modem looks a little different than the one shown.

Mr. B: "You still haven't convinced me. What else do I need to know before I can get started?"

MM: "I can send data in either *full duplex* or *half duplex*. I can *originate* a signal and *answer* one, or originate transmissions only or answer transmissions.



Note: Full duplex: This is a modem that is capable of sending and receiving data signals at the same time.

Half duplex: This is a modem that can transmit data in either direction, but it can only send or receive at any one time. This modem *cannot* do both at the same time.

Originate: The computer terminal originates the carrier tone for use over the phone lines (the most common use of the answer/originate modes).

Answer: This mode is used when two computers want to talk to each other or when the computer is being used as a receiving center for messages or data.

The diagram is an example of a simple modem that can be used for any of the above listed combinations when transmitting or receiving data. Most commercially purchased modems today are the answer/originate and full- or half-duplex type.

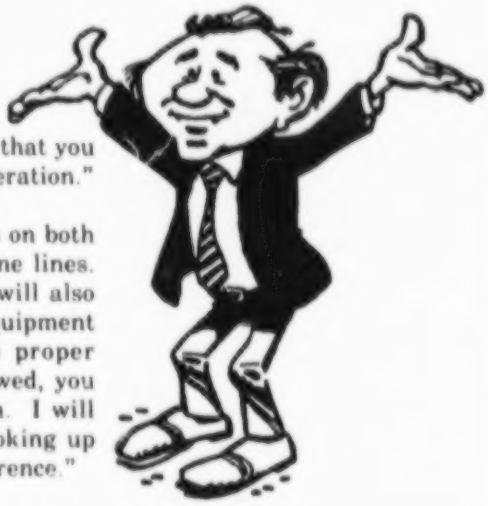
Mr. B: "So, you say that you are fast. Well, just how fast are you?"

MM: "I can talk (send signals) at a variety of *baud* rates—anywhere from 110 bauds per second (bps) to 9,600 bps. At 300 bauds, I send one *bit* of information in 3.3 milliseconds to another computer or terminal.

Now, wouldn't you say that's fast? I'll bet that all of your computer operators combined couldn't send information to another computer that fast!"

Note: Baud: A unit of signaling speed. The speed in bauds is the number of signal elements per second.

Bit: The smallest unit of information in computer language.



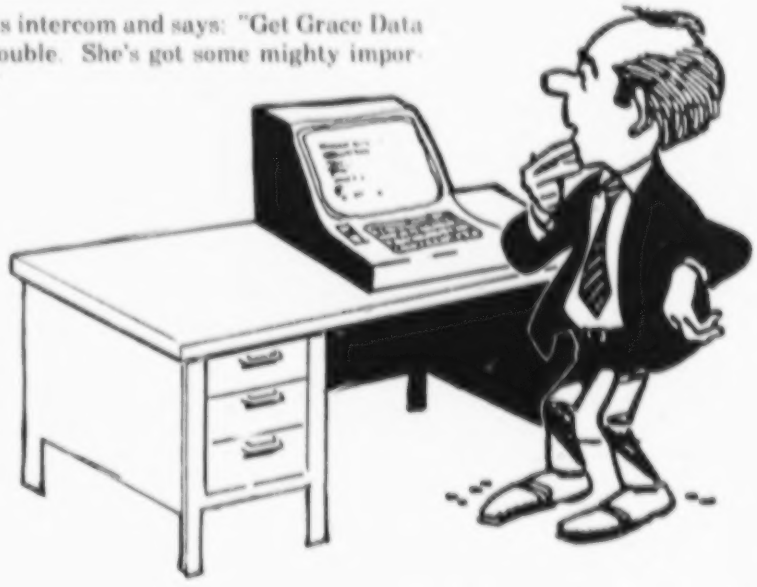
Mr. B: "Look, *Mighty Modem*, I'm convinced that you can help us. Let's get you hooked up and in operation."

MM: "Hold on. First you will need modems on both the *originate* and the *answer* end of the phone lines. Each computer or terminal to be hooked in will also need an *RS-232* cable. Once you have this equipment ready to go, it must be connected in the proper sequence. If these connections are not followed, you may have problems and receive garbled data. I will put the proper installation procedure for hooking up your modems on your computer screen for reference."

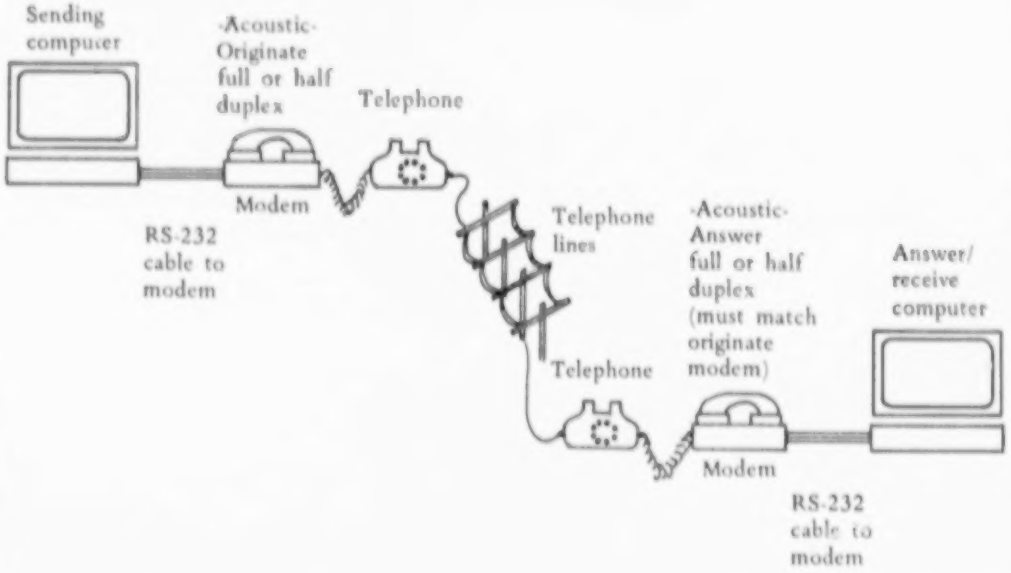
Note: RS-232: This is an industry standard for interconnection of equipment. It can be connected for parallel transmission, in which data travels down eight parallel wires simultaneously, or for serial transmission, in which data travels bit by bit down one wire in a stream of bits.

As Mr. B turns to view his computer screen, our super hero transmits himself back over the phone lines to his desk at Digitron World Headquarters.

Mr. B turns to his intercom and says: "Get Grace Data in here on the double. She's got some mighty important work to do!"



Note: Here is what *Mighty Modem* puts on the computer for Mr. B to see. It is the special hookup for using modems.



Mr. Big of Littletown Manufacturing Company is now happy. His modems are working and transmitting data by the hour to his many new accounts. By using modems, Mr. B is saving time and money. There are fewer mistakes in data received, and all of the new accounts are pleased with the increased speed and efficiency. This has transformed Mr. B

from this ..... to this

As for our super hero, he is back as usual at his desk programming, answering questions, and waiting—waiting for his next call for help as *Mighty Modem*. He's doing his part to help keep those computers and terminals talking via telephone modems.

Mighty Modem

Name _____

Class/Period _____

1. What is the primary purpose of modems?

2. Describe what handshaking is?

3. What are the two major types of modems?

4. A _____ duplex modem can send and receive signals at the same time, while a _____ duplex modem can only send or receive at one time.

5. Most modems sold today can both send and receive signals. (Circle correct answer.)
   T or F

6. What is a bit?

7. What two words make up the word *modem*?

8. What is baud rate?

9. Briefly define these terms:

modulator/demodulator

modem

handshake

baud

bit

RS-232

acoustic modem

direct-coupled modem

full duplex

originate

answer

half- duplex

serial transmission

parallel transmission

(3A) Interactive Light Systems and Processes

Communications

Laser Beam Characteristics, an activity supporting the Light Communications concept, is designed for approximately 1 class period.

Resources Needed

Equipment

A metrologic .8-watt neon laser
Circle template from 1/32" to 1" or ruler

Materials

Chalk and chalk erasers

Objectives

The student will

learn about unique characteristics of a laser beam;
become familiar with various applications of the laser beam; and
consider possible future applications of the laser beam.

Evaluation Focus

☒ Knowledge	☒ Problem Solving	☐ Attitude
☐ Awareness	☐ Machine/Tool Usage	

Laser Beam Characteristics

Procedure

What is a laser? The word is an acronym for a descriptive phrase used by physicists: **L**ight **A**mplification by **S**timulated **E**mission of **R**adiation. Laser light, like any other light, is invisible to our eyes unless it is traveling in a direction that will permit it to enter the eye and fall on the retina. When small particles, such as dust, are in the laser beam's path, much of the light still will be transmitted, but some will be scattered by small particles. This scattering of light allows us to see the laser beam. Whenever scattering occurs, there will be some absorption of the laser beam, which will weaken its intensity as a result.

▶ Caution

The laser projects a powerful, concentrated beam of light that can be harmful to your eyes. Do not look directly into the beam nor into the reflected beam. Similarly, do not direct the beam or its reflection into anyone else's eyes.

1. Go to the laser and be sure it is on. Take with you chalk erasers that have collected chalk dust and a circle template or a ruler.

2. Shake chalk from a blackboard eraser in front of the laser and observe the scattering effect.

3. With a ruler or a circle template, measure and record the size of the laser beam where it exits the metrologic laser.

4. Measure and record the size of the laser beam after it has traveled approximately ten feet.

5. Read the following paragraphs, and then answer the appropriate questions on the Student Response Sheet.

Different frequencies of light produce different colors. An ordinary flashlight emits white light, which contains all colors of the light spectrum—red, orange, yellow, green, blue, and violet. Laser light, on the other hand, is always made up of waves of the same frequency, so it appears as a single color of light. This characteristic is known as monochromaticity, from mono (single) and chromatic (color).

In order to produce a light wave that is monochromatic, all of the waves have to be of the same wavelength and frequency. Each color of light has its own unique wavelength and frequency. Lasers come in several different colors depending on what material is used to produce the beam. Lasers can be found in colors such as violet, red, and blue-green. High-frequency light, such as violet light, has a short wavelength and high energy; low-frequency light, such as red light, has a long wavelength and low energy.

Because the laser is made up of light that is all one wavelength, it travels extremely straight. Think about a flashlight beam and how its light spreads out compared to the laser beam. Laser light is said to be *coherent*—it travels in a straight line. A flashlight is said to be

incoherent. Incoherent light spills out randomly, its waves are varied in length, and they are not of the same frequency. Sunlight, candlelight, and electric lights are all incoherent.

One of the chief advantages of a laser is that it produces a beam of light whose edges are parallel. Any deviation from perfect parallelism will eventually cause a beam to diverge and spread out its energy, becoming weaker and weaker with distance. Perfect parallelism, however, is a goal difficult or even impossible to achieve under practical conditions. Still, a coherent laser beam can be transmitted a great distance before much spreading occurs.

Many applications of the laser have been developed already. Each application takes advantage of one or more of the laser's unique beam characteristics. Surveyors, for example, take advantage of the parallelism of the laser beam to measure elevations of land, instead of using a typical builder's transit. Pipeline workers use the laser to help assure pipes are placed in a straight line (for better welds) and to make sure proper slopes are achieved. The military takes advantage of the laser's ability to direct light with a low degree of beam stray. Since a laser beam can't be seen unless its beam is aiming directly into an eye, it can be used to mark enemy vehicles without detection. This allows the military to determine the distance from the vehicle by timing how long it takes for the beam to reflect back. Once a vehicle is marked, it then becomes an easier target for air or ground attack, using the beam as a guidance system for missiles. Similarly, the medical profession is taking advantage of the laser's ability to concentrate its beam into an extremely small area. Lasers are used in surgery to remove everything from warts to cancer. The laser beam creates a precise incision that is both sterile and resistant to bleeding. The concentrated beam produces enough heat to cut only where it is aimed, without harming surrounding tissue. The heat of the beam also seals off blood vessels to prevent most bleeding.

Laser Beam Characteristics

Name _____

Class/Period _____

1. What color is light from the metrologic laser?

2. Why does the laser beam become visible when you shake chalk in front of it?

3. Describe the difference between the light of a flashlight and a laser beam?

4. How much does a laser beam spread over a ten-foot distance?

5. What does monochromatic mean?

6. List three unique characteristics of a laser beam?

7. What are some present applications of the laser beam?

8. What is a coherent light source?

9. What is one safety rule you should remember whenever you use a school's laser?

10. What might be some future applications of the laser beam?

(3A) Interactive Light Systems and Processes

Communications

Laser Communications and Fiber Optics, an activity supporting the Light Communications concept, is designed for approximately 1 class period.

Resources Needed

Equipment

Metrologic laser
Laser receiver
Crystal microphone

Materials

Fiber optic cables

Objectives

The student will

use the laser light to transmit the human voice;
gain an appreciation for the importance of fiber optics and its applications; and
understand the advantages of the laser and fiber optics versus conventional telephone coaxial cables for information transmission.

Evaluation Focus

☒ Knowledge
☐ Awareness
☒ Problem Solving
☐ Machine/Tool Usage
☐ Attitude

Laser Communications and Fiber Optics

Procedure

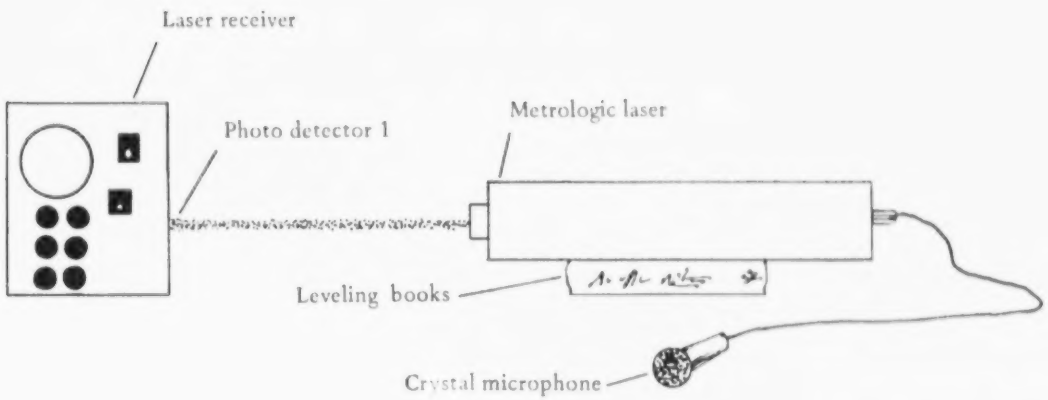
Since its invention in 1958, the laser beam has been an important tool. New applications for lasers are being developed every day. The potential of laser applications is truly infinite. Among its already wide variety of uses, one important application is in the transmission of information and data. Through a laser beam, an office in Manhattan will be able to deliver to an office in Los Angeles the information equivalent of an entire 30-volume set of encyclopedias in less than 1/10th of a second. Not since the development of the computer has there been a device with equal or greater potential to change the way we live, learn, and communicate.

To learn more about this exciting and revolutionary tool, the procedure below asks you to set up and perform a laser activity.

▶ Caution

The laser projects a powerful, concentrated beam of light that can be harmful to your eyes. Do not look directly into the beam, nor into the reflected beam. Similarly, do not direct the beam or its reflection into anyone else's eyes.

1. Set up a laser, microphone, and laser receiver according to the diagram.



2. Plug the microphone into the back of the laser.

3. Place the laser receiver approximately five feet away from the laser.

4. Plug in the laser and point the beam into Photo Detector #1 located on the side of the receiver box.

5. Plug in the receiver box.

6. With one person at the laser and one at the receiver, try to communicate across the laser beam by talking into the microphone (try tapping lightly on the microphone and talking into it, but do not whistle).

7. **After you have successfully set up and completed this activity, answer Questions 1 through 3 on the Student Response Sheet.**

This activity demonstrates that lasers can indeed transmit sound waves through their beam of light; but we also found that the beam is vulnerable to blockage, which causes a breakdown of the communication process. If we were to transmit all phone conversations with an exposed laser beam, every time a bird, plane, or other object blocked the beam, we would lose valuable information.

To make laser communication less vulnerable to interference, fiber optic cables have been developed. One such light-guiding cable, holding 144 glass fibers, is smaller than an average forefinger and can handle more data than four standard copper cables. Picture a tube of glass only half the diameter of a human hair stretching from New York to Los Angeles. Through the tube, an intense beam of laser light is being pulsed on-off, on-off millions of times a second. These pulses carry data, video pictures, and the human voice faster than anything experienced before. Fiber optic cable also prevents beam blockage from outside interferences, allows for easy transmission around corners, and helps contain the laser beam in order to prevent spreading over a long distance.

1. Obtain a section of fiber optic cable.

2. The fiber optic cable will look like a length of wire, but instead of metal inside, it will have glass.

3. Place one end of the cable into the laser beam opening.

4. Look at the opposite end of the fiber optic cable.

5. **Answer Questions 4 through 6 on the Student Response Sheet.**

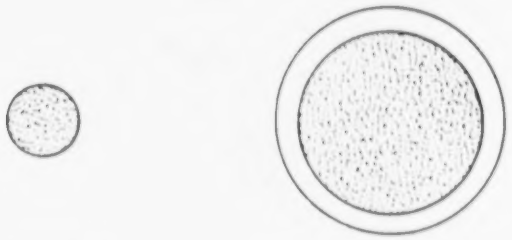
A fiber starts out as a glass rod about three-quarters of an inch thick, which has controlled amounts of impurities in it. The rod is then heated and pulled like taffy into fiber that may be ten miles long and only three-thousandths of an inch thick. Covered with a plastic coating (or cladding) to prevent scratching and breaking, the completed strand is about as thick as a horsehair. Dr. Walter P. Sigmund of the American Optical Corporation has described the laser beam in the fiber optic cable. "A light beam travels through an optical fiber much like a bullet ricocheting down a steel pipe. The beam caroms through the fiber's core, trapped there

by the cladding. The cladding does more than simply confine the light. It provides a mirror effect, turning the light back into the core (center of the cable). This creates what is known as 'total internal reflection.' It is so perfect that you can have millions of such reflections through many miles of fiber and still have a light beam emerge largely undimmed."

Even if you bend the fiber optic cable and tie it into knots, the light will still go around the bends without leaking out. (**Note:** This is not a suggestion. Please don't try making knots in the fiber optic cable.) In order to transmit a signal many miles through fiber optic cable, the cable must be made of very pure glass. Any impurities in the glass cause internal reflections and loss of communication.

Answer Questions 7 through 9 on the Student Response Sheet.

Telephone coaxial cables stuffed with copper wires measure 4-1/2" in diameter and carry fewer conversations than the new light wave fiber optic cable, which measures 1/2" in diameter. A wire telephone cable is typically jammed with 1,800 copper wires that can carry 900 simultaneous telephone conversations for distances of 3,000 to 6,000 feet before amplification is needed. The light pulses generated by a semiconductor laser can carry up to 500,000 simultaneous telephone conversations through fiber optic cable ten miles before amplification is required. The materials used to make the old telephone coaxial cables consist of plastic and precious metals. Precious metals are limited in their abundance and as such are becoming increasingly more expensive. The materials needed to produce fiber optic cable are primarily plastic and glass. Glass is made out of silica, more commonly known as sand, which is abundant on earth. Therefore, the cost of fiber optic cable is considerably cheaper than the metal used in telephone wires.



Fiber optic cable Copper telephone wire

The above is a size comparison of cross-sections of copper telephone wire and a fiber optic cable. Each of the cables has an equal information transmission capacity.

Answer Questions 10 and 11 on the Student Response Sheet.

Laser Communications and Fiber Optics

Name _____

Class/Period _____

1. Does the diagrammed setup work? Explain what happens when you talk into the microphone.

2. Would this same process work across the entire room? Explain why it would or would not.

3. Explain what happens when you place your hand in front of the laser beam.

4. What do you see when you look at the end of the fiber optic cable opposite the laser? Explain.

5. How does the beam act when projected into the fiber optic cable?

6. List at least three advantages of the fiber optic cable compared to an exposed laser beam.

7. What material is the fiber optic cable made of?

8. What might be wrong with using a fiber optic cable for transmitting information? Explain.

9. In *your own* words, describe how the laser beam travels in the fiber optic cable.

10. What are five major reasons that lasers and fiber optics are being used for the transmission of information?

11. What might be some future uses of lasers for communications?

(3A) Interactive Light Systems and Processes

Communications

Laser Holography, an activity supporting the Light Communications concept, is designed for approximately 1 class period.

Resources Needed

Equipment

.8-watt metrologic neon laser
8-mm divergent lens with holder
8" x 10" transmission hologram slide (available from science supply catalogs) **Note:** This example uses a holographic slide of a telephone.

Objectives

The student will

set up a laser, spread its beam, and produce a three-dimensional image;
view a three-dimensional image and compare it to a two-dimensional image; and
learn present applications of holography and consider future uses.

Evaluation Focus

☒ Knowledge	☒ Problem Solving	☐ Attitude
☐ Awareness	☒ Machine/Tool Usage	

Laser Holography

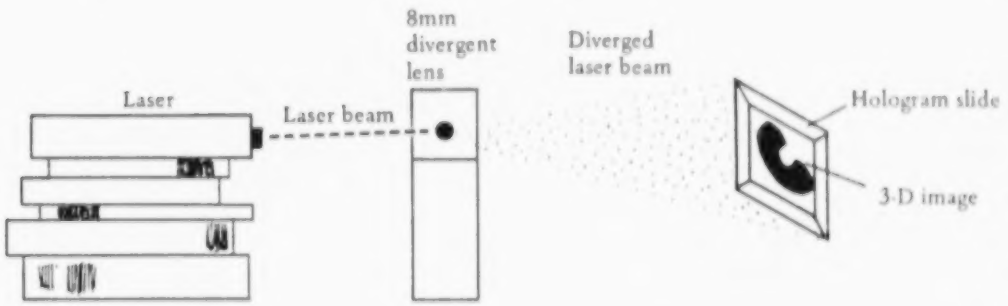
Procedure

One of the most promising applications of continuous laser light is its ability to make three-dimensional images called holograms. A hologram differs from an ordinary photograph by the depth it portrays. If you look at an ordinary color photograph, everything appears flat. Objects in the background will appear directly behind anything in the foreground. When composing photos, photographers must be careful of what lies directly behind the main subject. Objects that are in the background can ruin a photo. For example, if a portrait is taken of a person standing in front of a tree, quite often the tree trunk will appear to be emerging out of the person's head. This occurs because a photograph can only reproduce a two-dimensional image. All depth (the distance from front to back) in a photograph will appear on one plane. This is not the case with a hologram.

▶ Caution

The laser projects a powerful, concentrated beam of light that can be harmful to your eyes. Do not look directly into the beam nor into the reflected beam. Similarly, do not direct the beam or its reflection into anyone else's eyes.

1. Set up the laser equipment as shown in the diagram.



2. Use books or magazines to lift the laser so the beam travels horizontally through the 8-mm divergent lens without any movement.

3. Obtain the large glass hologram slide.

4. Tilt the slide in front of the diverged (spread) laser beam until you see the three-dimensional image in it.

5. In order to see the image, you may have to flip the plate around several times until it comes in clearly. The angle at which you view a hologram is critical. View the image from different angles (it is safe to look at the laser beam once it has been spread by the divergent lens). **Note:** If you cannot see the holographic image, try looking through the glass slide to a point behind it.

6. **Answer Questions 1 through 3 on the Student Response Sheet included with this unit.**

The hologram reproduces an image that looks very real. Our eyes naturally see everything in three dimensions. Three dimensional means we see lengths, widths, and depths of objects. Hologram comes from the Greek words "holo" and "gramma" meaning "the whole message." A hologram records a complete message of all the visual aspects of an object. When you replay that complete message later, you will see what the object actually looked like in real life.

A hologram is made by exposing a photographic negative to a scene that is wholly illuminated with laser light. A film is placed so that a split laser beam contacts it from two directions. One part of the beam, the reference beam, is directed to the film by mirrors in an undisturbed pattern. The second part of the beam, the subject beam, is directed by mirrors first to the object being photographed. From there, it is reflected back to the film in distorted form. The distortion is caused because objects reflect light in all directions in a scattered pattern. When two parts of the laser reunite on the film, parts are in phases causing strongly exposed film. In the areas where the uniting laser is out of phase, some cancellation occurs on the film, and the exposure is weaker. This mottled film is called a hologram.

When the hologram is submitted to a diverged laser beam, the film scatters the light to reconstruct the original image in three dimensions. Interestingly enough, if the hologram is cut into small pieces, each will reflect the entire image when observed under the laser. This occurs because each portion of the film received reflects light from the complete object, but each at a different angle, causing the three-dimensional effect.

7. **Answer Questions 4 and 5 on the Student Response Sheet.**

Holography is used in a large number of applications today. In grocery stores, holography is used to read universal product codes on product packages. It speeds up the checkout process and, at the same time, keeps track of inventory for the store. Holography is making it harder for counterfeiters to alter the account numbers on credit cards. If any attempt is made to change an account number, a hologram on the card is destroyed, making it obvious that the numbers have been altered. Holography is also used in the commercial airline industries. A holographic image can be projected onto the cockpit windshields to make it easier for the pilot to keep track of vital flight-path information by having the information in one handy spot. Holography is also used to point out ordinarily invisible deficiencies in such products as computer disk drives, aircraft and automobile parts, tires, pipes, pressure vessels, and tennis racket handles.

8. **Answer Questions 6 through 8 on the Student Response Sheet.**

Laser Holography

Name _____

Class/Period _____

1. What is a holographic image? Please define.

2. Describe what you see in the large hologram slide.

3. Describe what happens when you view the hologram from different angles.

4. What does the divergent lens do to the laser beam?

5. If we were to cut our holographic plate into eight pieces, how many complete three-dimensional images would we have?

6. Explain how a hologram differs from a photograph.

7. How might holography be used in the television and movie-making industry?

8. What might be some future uses of holography?

(3A) Interactive Light Systems and Processes

Communications

Reflection Hologram, an activity supporting the Light Communications concept, is designed for approximately 2 to 3 class periods.

Resources Needed

Facilities

Photographic laboratory and/or darkroom

Equipment

Helium-neon laser
Front surface reflection mirror
Diverging lens
Scissors
Film: AGFA 8E75 (NAH)
Chemicals: Kodak D-19
Photo-Flo
Green safelight
Vibration-free table
Developing trays and tongs
Film holder (two glass plates with clips)
Stands to hold the mirror and diverging lens

Materials

Object to use for hologram
Cardboard pieces
Black bags

Objectives

The student will

control a laser light beam;
expose and develop film; and
produce a white light, reflection hologram.

Evaluation Focus

- ☒ Knowledge
- ☐ Awareness
- ☒ Problem Solving
- ☒ Machine/Tool Usage
- ☐ Attitude

Reflection Hologram

Procedure

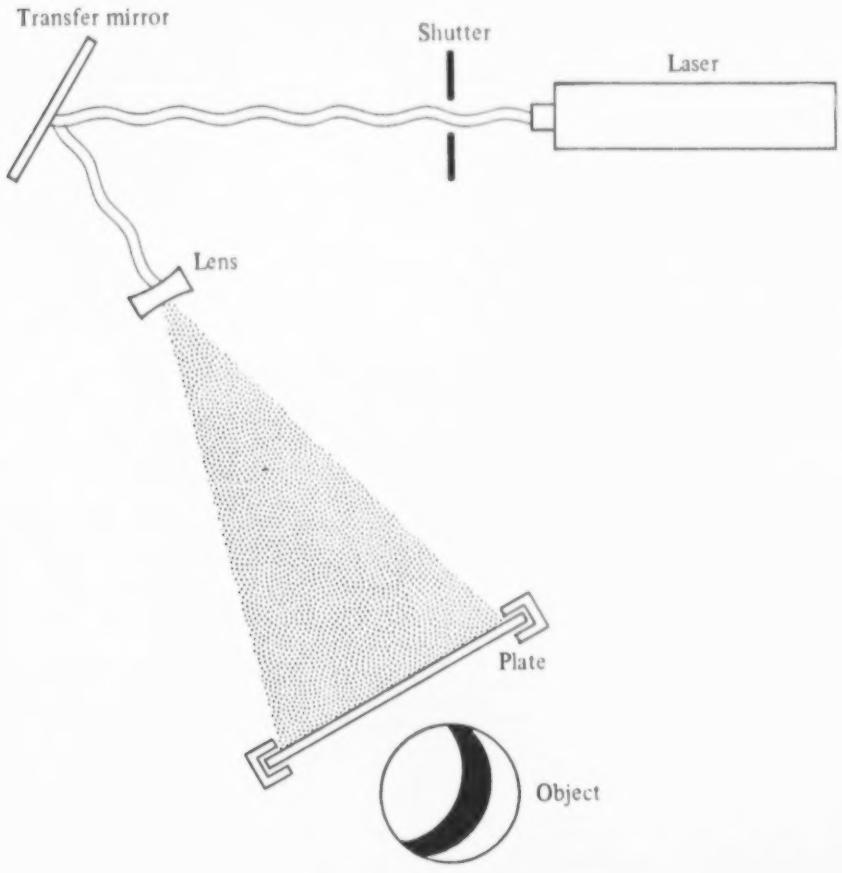
Professor Dennis Gabor, a British scientist, originated the basic ideas of holography in 1947, but none were produced then because he lacked an important ingredient—a source of coherent light. In 1960, United States scientists Juris Upatnicks and Emmet Leath used a newly invented laser to produce the first holograms showing an object in its three-dimensional form.

This activity is designed to take you through the steps necessary to produce a reflection hologram, which can be viewed using either sunlight or a white light source.

Setting Up the Materials

▶ Caution

The laser projects a powerful, concentrated beam of light that can be harmful to your eyes. Do not look directly into the beam, nor into the reflected beam. Similarly, do not direct the beam or its reflection into anyone else's eyes.



1. Set up all the materials as shown in the diagram. **Note:** The film holder must be supported by a solid surface. If it isn't, it will be susceptible to vibration, which will ruin your chances for a successful hologram.

2. Turn the laser on and turn off the room light.

3. Check that the laser light passes through the diverging lens and reflects off the mirror at a 60-degree angle.

4. Check to make sure that the light reflecting off the mirror covers your object completely after it passes through the film plane and that the object is in the center of the light.

5. Turn the room lights back on.

6. Pour the D-19 and Photo-Flo into the developing trays.

7. Place a piece of cardboard in front of the laser light to block the beam. This will act as a shutter in the exposing process. Be careful not to bump any equipment already set up.

Exposing the Film

Note: The only light that can be on while handling the film during the exposure and before it is developed is the green safelight. Handle the film only on the edges; fingerprints and dirt can ruin the chances of a successful hologram.

1. Turn the green safelight on.

2. Turn the room lights off.

3. Remove the film from its container and cut a piece of film that is at least a 3" x 3" size. Place the film back in the container and place the cut piece in one of the black bags.

4. Turn the room lights on and familiarize yourself with the setup of all the equipment.

5. Practice opening, closing, and placing the film holder back above the object so you can do it with ease. Remember, once the film is out, the only light that can be on is the green safelight.

6. Turn the room light off.

7. Remove the film from the black bag and determine which side is the emulsion side. This can be done by moistening your lips and placing a corner of the film on them. The emulsion side will become a little sticky.

8. Place the film in the film holder *emulsion side down* and secure with clips.

9. Place the film holder back on its stand.

10. Lift the cardboard off the table while holding it in front of the laser beam and wait 20 seconds before exposing the film.

Note: It is important to hold the cardboard off the table because when you're exposing the film, the table must be absolutely vibration free; any movement or vibration during the exposing process can ruin your chances for a successful hologram.

11. Lift the cardboard shutter away from the laser light and expose the film for approximately seven seconds.

12. Replace the cardboard shutter in front of the light and turn the laser off.

Developing the Film

1. Remove the film from its holder and place it emulsion side down on the D-19 developer for five minutes, slowly stirring the developer from time to time.

2. Lift the film out of the D-19 and let the excess developer drip off.

3. Wash the film in running water for ten minutes.

4. Remove the film from the water.

5. Place the film in the tray containing the Photo-Flo for 30 seconds.

6. Remove the film and gently wipe the excess Photo-Flo off with the sponge.

7. Let the film dry completely.

Viewing the Hologram

1. Sunlight works best for viewing your hologram, but any white light source (projectors, transparency machines, etc.) will provide adequate light.

2. Hold the film so the light source is behind you and the film is in front of you.

3. Turn the film so the emulsion side is facing away from you.

4. Move the film around until you see the real image of the object. (It will seem to appear in back of the film.)

5. The virtual image of the object can be seen by turning the film so the emulsion side is facing you.

(4B) Acoustic Storage and Retrieval Systems and Processes

Communications

Magnetic Tape Recording, an activity supporting the Acoustic Communications concept, is designed for approximately 5 class periods.

Resources Needed

Equipment
Cassette tape recorders

Materials
Blank tapes

Objectives

The student will
explore successful audio advertising techniques;
write two 30-second audio announcements; and
record two 30-minute audio announcements on a cassette tape.

Evaluation Focus

- ☒ Knowledge
- ☐ Awareness
- ☒ Problem Solving
- ☒ Machine/Tool Usage
- ☐ Attitude

Magnetic Tape Recording

Overview

Storing information is a very important part of communications technology. For hundreds of centuries, the only way to store information was by writing messages on a cave wall or, more recently, on paper.

Information storage is a necessary ingredient of all systems of communication, such as television, radio, and computers. All these systems store information electronically on a magnetic surface.

This activity gives an explanation of how this type of electronic storage works. It will also give you the opportunity to write and store your own message on the most common electronic storage device—the cassette tape or cartridge.

The material is structured so that it can be covered in approximately five class periods.

Day One

Read the entire package so you know what is required to successfully complete this activity.

Day Two

Start thinking of ideas for an announcement for a school activity. Write your ideas down on paper. Change your ideas into "what you are going to say" for your announcement.

Day Three

Practice reading your announcement using a "practice tape." Rewind the practice tape, and listen to your announcement. Ask for a "final" tape, and record your announcement for grading. **Note:** Do not rewind this tape.

Day Four

Work on ideas for a radio commercial. Write out what you are going to say. Practice reading what you are going to record.

Day Five

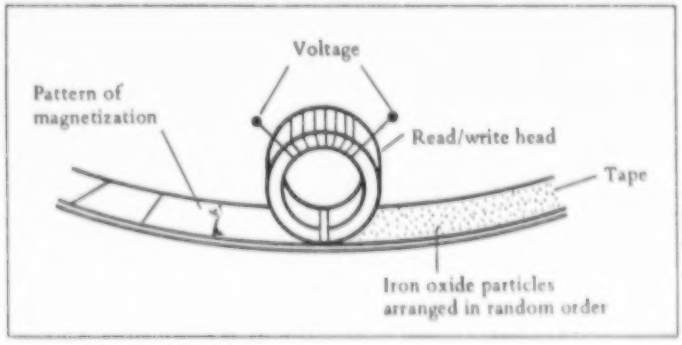
Make a practice recording of your radio commercial. Ask for a "final" tape, and record final copy. **Note:** Do not rewind this tape.

Magnetic Tape

Early tape storage systems were reel-to-reel. As machine tools and computers became smaller and smaller, this means of storage became less practical. The reel-to-reel format was too large and expensive. The tape format that evolved was the cassette or cartridge.

The flexible magnetic tape used in cassettes is inexpensive and durable. The tape consists of a base material of polyester. This is a relatively stable medium because it has good tensile strength and can stop and start repeatedly without breaking. The polyester also reduces the tendency to shrink or stretch when tension is applied. The polyester is made in wide ribbons coated with an iron oxide surface that is sensitive to magnetic fields. The polyester base with the magnetically sensitive coating is then cut into tape widths and applied to take-up reels.

Two critical functions of the cassette tape drive are the reading and writing of information onto the tape and tape transport. The magnetic head in a cassette tape drive is the device that actually records and retrieves information from the magnetic tape. The iron oxide on the surface of the tape is comprised of many needle-like magnetic particles. The particles are not aligned in any particular order when the iron oxide coating is applied to the tape's base material.



In order to store information on the magnetic surface, it is necessary to align the magnetic particles into a pattern. The magnetic head aligns the magnetic particles by using a tiny electromagnet to create a magnetic field, as shown in Figure 1.

The conventional magnetic head consists of a split ring-like substance wound like a coil. The gap on the front of the head is where the magnetic field is generated when current is applied to the winding.

When the cassette drive is in the "record" mode, sound waves from your voice are changed by the microphone into electronic signals. These signals activate the electromagnet, and a magnetic field is generated at the gap of the magnet. As the magnetic tape presses the head, this magnetic field aligns the particles on the tape in a form that later can be distinguished as your voice when the electric signals are played back through the speaker of the tape player.

Message Techniques

You will be preparing two messages and recording them on a cassette tape recorder. There are some techniques that will help you make a better announcement and/or commercial recording. It is also helpful to know that generally we use about

25 words for a 10-second commercial;
45 words for a 20-second commercial;
80-85 words for a 30-second commercial; and
160-170 words for a 60-second commercial.

The Attention-Getting Device

Before any commercial can be effective, it must be heard by the listening audience. People tend to "tune out" when a commercial comes on, yet everyone has certain commercials to which they do listen. If you have in mind a commercial that you can remember listening to, chances are the writer of that commercial message utilized a successful device to get your attention.

Typical attention-getting devices are:	Examples:
a loud bar from a familiar tune	"We'd like to give the world a coke."
a direct question	"Are you bothered by stomach acid? Try Rolaids."
the voice of a popular personality	Ed McMahon for Budweiser

Repetition of Product Name

No matter how many people enjoy or listen to a radio commercial, it isn't effective if the listeners don't remember the name of the product advertised. It is important that the product name be repeated several times during a commercial to insure the listener at least is given the opportunity to remember the name of the product.

Although there is no hard and fast rule as to how many times a name should be repeated in a given time span, it is a good idea for the beginning writer to repeat the product name about once every ten seconds of air time, with a minimum of one repetition (name used twice) in any commercial. As advertising becomes frequent and long term for a given product, the writer may realize the theme song or the voice of the announcer has become synonymous with the product name, and less repetition is necessary.

Clarity of Expression

As a writer, you want all of your product information to be understood by your audience. Assuming a relatively large audience, keep your language clear and simple, avoiding long, complex sentences and technical terms. If you are writing a commercial to be read live over the air, avoid tricky, hard-to-say phrases, like "Peter Piper picked a peck," etc. Announcers are professionals, but they do make mistakes, especially when they do not have time to practice everything they are to read on the air.

Finally, try to be imaginative and humorous, but communicate your idea. Your delivery must sell your idea. Practice, practice, practice so you don't sound like you are reading word for word. Especially, try to make it sound interesting.

Preparing Your Message

Message Number 1 (First recording)

1. Think of an announcement for an activity that would take place in school. Your announcement should be approximately 30 seconds long. That means you will need approximately 80 words to complete your idea. It should be informative, telling your listeners all the important details they need to know. Try to have the information in your announcement answer the following questions. Who? What? When? Where? Why?

2. Write your copy and revise it.

3. Practice reading it aloud. When you feel comfortable, practice reading your message on a practice tape, so you can play it back and make any necessary adjustments.

4. When you are ready, ask your instructor for the "final" tape. Turn the recorder on, state your first and last name, and then record your message.

5. When finished, press "stop" only. **Note:** Do not rewind this tape. The next person will begin recording where you ended.

Message Number 2 (Second recording)

1. Imagine that you are the campaign manager for a new product, and you are responsible for creating a recorded commercial to be aired on the radio. If you can't think of a new product or idea, you may use an existing product, but try to make your commercial original. This commercial will also be 30 seconds in length, so again you will need about 80 words.

2. Remember to use the three message techniques when writing out your idea: the attention-getting device; repetition of the product name, and clarity of expression.

3. Follow the same procedure you used for your first message by writing, practicing, and recording your commercial.